Fuji Electric

Innovating Energy Technology

High Performance Vector Control Inverter

FRENIC-VG Series

FUJI INVERTERS

High performance enabled by the comprehensive use of Fuji technology.
Easy maintenance for the end-user.
Maintains safety and protects the environment.
Opens up possibilities for the new generation.

24A1-E-0002

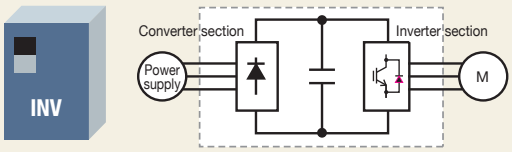
The Dawn of a New Era

The FRENIC-VG is creating a new era via the industry-leading performance.

With the FRENIC-VG, Fuji has concentrated its technologies to deliver the best-performing inverter on the market. In addition to basic performance, this model features the following dramatic improvements: support for previously difficult applications due to technical and capability limitations, easier, more user-friendly maintenance, and environmental friendliness and safety. Fuji Electric proudly introduces the FRENIC-VG to the world.

Product introduction

Inverter (Unit Type)



This type consists of the converter and inverter circuits.The inverter can be operated using a commercial power supply.
* DC power can also be supplied without using the converter circuit.

Structure

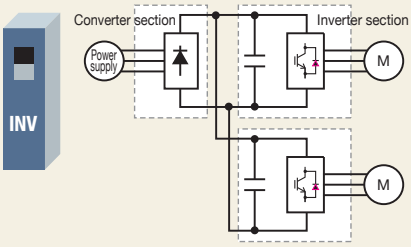
- Built-in converter (rectifier)
- Built-in control circuit
- External DC reactor as standard*
- DC input is available.

* Available for 75kW or higher capacity models

Features

Easier arrangement for small-scale system

NEW Inverter (Stack Type)



The converter and inverter sections are separately set in this type.The converter (diode stack) or PWM converter is required depending on the intended use. Moreover, a combination of inverters can be used with one converter.

Structure

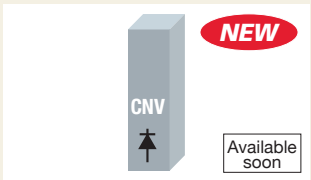
- The converter (rectifier) is separately set.
- External control circuit
- Built-in DC reactor

Features

- DC supply enables the multi-drive arrangement
- Energy can be shared within DC bus lines.
- Downsized panel
- Large-capacity system is easily built.
- Maintainability

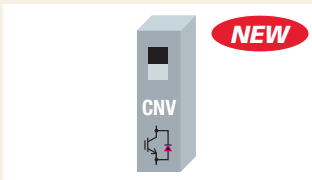
Converter

Diode rectifier RHD-D series

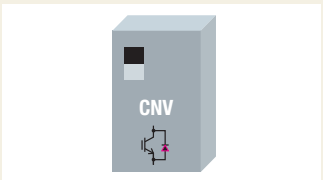


This converter is used where no electric power regeneration is required.

PMW converter (Stack Type) RHC-D series*



PMW converter (Unit Type) RHC-C series*



This converter is used where electric power regeneration or harmonic control is required. Peripheral devices are separately required.

* D series and C series differ in form but show identical function and performance. Please use them according to the installation space and purposes.

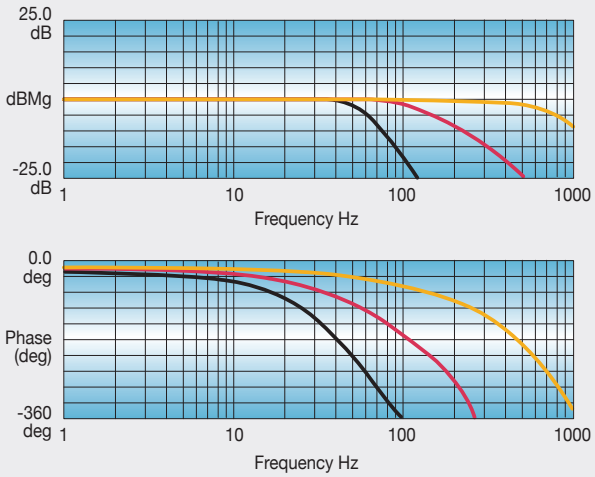
Improved Control Performance

Realizes the industry-leading control performance

Induction motor

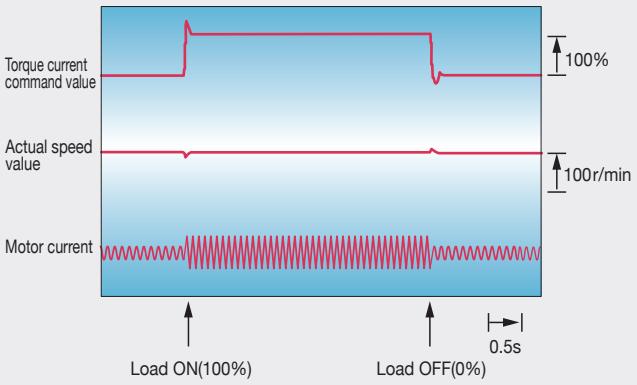
Achieved speed response of 600 Hz

(Tested with a dedicated motor with PG under vector control with speed sensor: about six times greater than our conventional model)



* With the stack type, "100 Hz" is achieved.

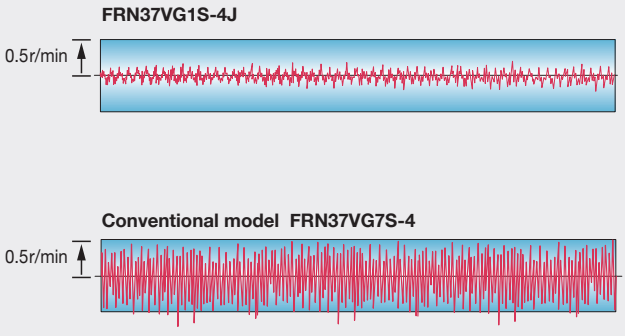
Follow-up characteristics under impact load



FRN37VG1S-4J, at 500r/min operation

Uneven rotation reduced by one-third

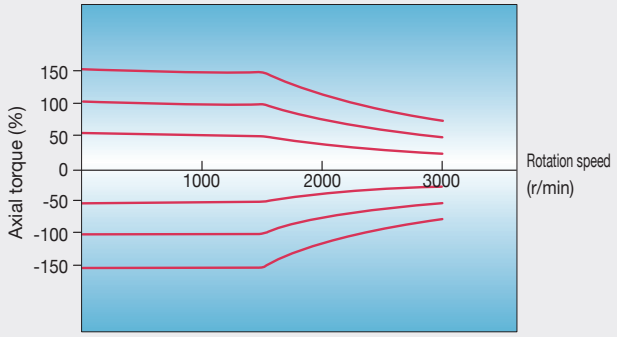
* Compared with our conventional models



at 30r/min operation

Speed and torque characteristics

Under vector control with sensor



FRN37VG1S-4J

A Wide Range of Applications

Ratings for intended use

The operation mode for the motor is selected according to motor load condition. Motors larger by one or two frames can be driven with medium load (MD) and light load (LD) use.

Specification	Applied load	Feature	Applicable overload rating	Power supply voltage	Applicable motor capacity [kW]	
					Unit Type	Stack Type*2
HD	High Duty Spec	Powerful drive at low noise	Current: 150% 1min/200% 3sec	200V	0.75 to 90	——
				400V	3.7 to 630	——
MD	Middle Duty Spec	Can drive motors of frames one size larger *1	150% 1min	200V	——	——
				400V	110 to 450 *2	30 to 800
LD	Low Duty Spec	Can drive motors of frames one or two sizes larger *1	Unit type:120% 1min Stack type:110% 1min	200V	37 to 110	——
				400V	37 to 710	37 to 1000

Note) A DCL may be selected according to applicable specifications.
*1 This varies depending on motor specifications and power supply voltage (unit type only).
*2 Carrier frequency becomes 2kHz.

A standard built-in brake circuit with expanded capacity range

Having a standard built-in brake circuit (with 200V 55kW or less and 400V 160KW or less), is useful when applying the inverter to the vertical transfer machine, which is frequently used under the regenerative load.

* Unit type only

Servo function

- Position control by built-in APC
- The ABS encoder I/F option card with 17-bit high resolution has been prepared.
- Pulse train input enabled (optional)
- The option card for the SX and E-SX bus I/F has been prepared.

Control method

Not only the induction motors but also the synchronous motors can be driven, and for the induction motors, you can select the most suitable control method according to your individual needs.

Target motors	Control method
Induction motor	-Vector control with speed sensor -Speed sensorless vector control -V/f Control
Synchronous motor	- Vector control with speed sensor (including pole position detection)

A wide range of options

- Providing options supporting various interfaces such as high-speed serial communications
- Options can be used by just inserting them into the connectors inside the inverter. Up to five cards can be mounted.
  (For details, please contact us because the combination of the optional cards has some restrictions.)

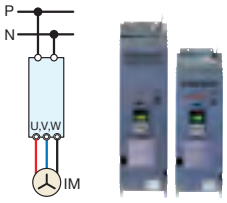
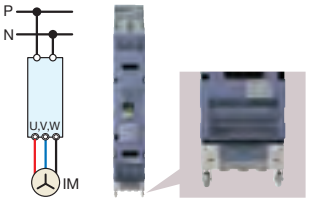
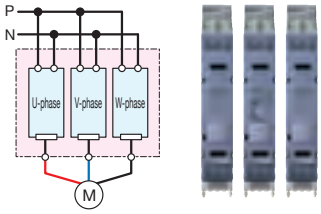
Categoly	Name		Type
Analog card	Synchronized interface		OPC-VG1-SN*1
	F/V converter		OPC-VG1-FV*1
	Analog input/output interface expansion card		OPC-VG1-AIO
Digital card (for 8-bit bus)	Digital input		OPC-VG1-DI
	Digital input		OPC-VG1-DIO
	PG interface card	+5V line driver	OPC-VG1-PG
		Open collector	OPC-VG1-PGo
		ABS encoder with 17-bit high resolution	OPC-VG1-SPGT
	PG card for synchronous motor drive	Line driver	OPC-VG1-PMPG
		Open collector	OPC-VG1-PMPGo
	T-Link communication card		OPC-VG1-TL
	CC-Link communication card		OPC-VG1-CCL
	High-speed serial communication card (for UPAC)		OPC-VG1-SIU*1
Digital card (for 16-bit bus)	SX bus communication card		OPC-VG1-SX
	E-SX bus communication card		OPC-VG1-ESX
	User programming card		OPC-VG1-UPAC*1
	PROFINET-IRT communication card		OPC-VG1-PNET*1
Safety card	Functional safety card		OPC-VG1-SAFE
Field bus interface card	PROFIBUS-DP communication card		OPC-VG1-PDP*1
	DeviceNet communication card		OPC-VG1-DEV*1
Control circuit terminal	Terminal block for high-speed communications		OPC-VG1-TBSI

*1 comming soon

A Wide Range of Applications and Easier Maintenance

Product Arrangement and Easier Change of the Inverters (Stack type)

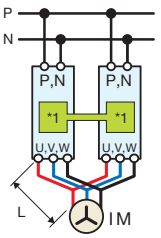
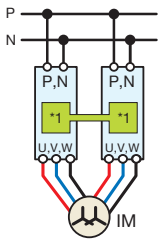
The inverters (stack type) have an arrangement with consideration for the installation of the product into the panel and easier change.
The inverters (stack type) (132 to 315 kW) can easily be installed or changed because they have wheels.
With the inverters (stack type) (630 to 800 kW), stacks are divided for each output phase (U, V and W), which has realized the lighter weight.

Nominal applied motor capacity [kW] (MD spec)	30 to 110	132 to 315	630 to 800
Type	FRN30SVG1S-4□ to FRN110SVG1S-4□	FRN132SVG1S-4□ to FRN315SVG1S-4□	FRN630BVG1S-4□ to FRN800BVG1S-4□
Categoly	Single unit	Single unit	Stack by phase
Wheels	Not provided	Provided	Provided
Arrangement			
Maintenance	The weight of one stack is reduced (50 kg or less) to give consideration to replacement work. Type / Weight [kg] FRN30SVG1S-4□ / FRN37SVG1S-4□ / FRN45SVG1S-4□ : 28 FRN55SVG1S-4□ / FRN75SVG1S-4□ : 35 FRN90SVG1S-4□ / FRN110SVG1S-4□ : 43	The models where each stack is heavy have wheels in order to change the stacks easily. A lifter for replacement*1 is available. Lifter (Conceptual view)	Trim weight by dividing the stack into 3 parts by each output phase (U, V and W). In the event of a breakdown, only the target phase needs to be replaced with a new one. The stack to be replaced should be an exclusive part.

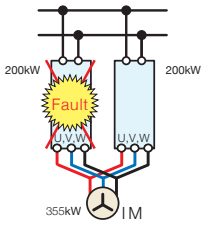
*1) The lifter will be available soon.

How to expand the capacity range of the inverters (stack type)

Direct parallel connection system and multiwinding motor drive system are provided for driving a large capacity motor.

System		Direct parallel connection system	Multiwinding motor drive system
Features	Drive motor	Single-winding motor	Multiwinding motor (Exclusive use motor where winding separates off)
	Restriction of wiring length	The minimum wiring length (L) varies with the capacity.	There is no particular limit.
	Engine cut off operation*2	Enabled	Enabled (However, the wiring should be switched over.)
Number of inverters to be connected		2 to 3 inverters	2 to 6 inverters
Arrangement diagram		When 2 inverters are connected 	When 2 inverters are connected 

*1) OPC-VG1-TBSI is separately required.
*2) Engine cut off operation. If a stack fails in case of direct parallel connection, the operation continues with lower output power using the stacks that have not failed



Example) If one inverter goes wrong when 200kW x 2 inverters are driving a 355kW motor, you can continue operation with the 200kW inverter (capacity of one inverter).

(Note) To start the engine cut off operation, consideration is needed to the switch over operation of PG signals or motor constants and sequence circuit. For details, refer to the operation manual.

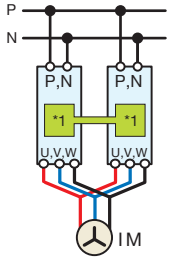
Example of the arrangement when direct parallel connection is used

Parallel connection of the 2 or 3 inverters with the same capacity enables larger capacity and system redundancy.
A typical combination is shown in the table below, but other combinations are also available.

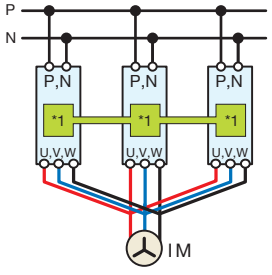
Combination example for direct parallel connection

Nominal applied motor capacity [kW] (MD spec)	Stacks arrangement examples
355	FRN200SVG1S-4□×2
400	FRN220SVG1S-4□×2
500	FRN280SVG1S-4□×2
630	FRN220SVG1S-4□×3
710	FRN280SVG1S-4□×3
800	FRN280SVG1S-4□×3

2 direct parallel connection systems



3 direct parallel connection systems



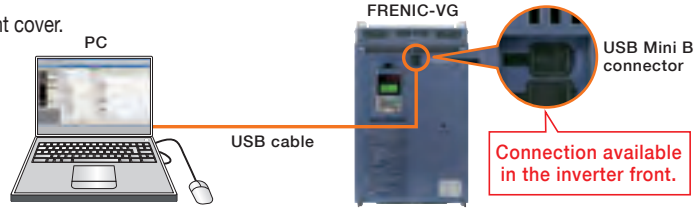
*1) OPC-VG1-TBSI is separately required.

Easier Maintenance and Greater Reliability

Upgraded PC loader functions

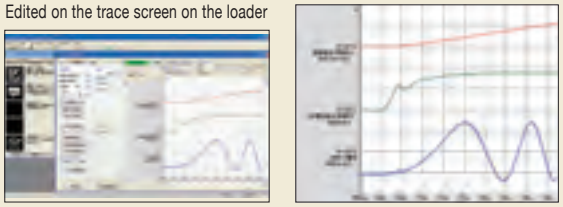
PC Loader can be used via the USB connector (mini B) provided on the front cover.

- The front cover does not have to be removed.
- No RS-485 converter is needed.
- Commercial cables can be used.



[Fault diagnosis using the trace back function]

Edited on the trace screen on the loader



- Internal data, time and date around the fault are recorded.
  The real-time clock (clock function) is built-in as standard.
- Data are backed up by battery.
  *Battery: 30kW or more (built-in as standard), up to 22kW (available as option: OPK-BP)
- Trace waveform can be checked on the PC loader

[Easy edit and detail monitor]

Data editing and detailed data monitor analysis operations are much easier than with a conventional PC loader.

Function code setting User-defined displays (customized displays), data explanation display for each code.

Trace function Real-time trace: for long-term monitoring
Historical trace: for detailed data diagnosis for short periods
Trace back: for fault analysis (last three times)

*The paid-for loader software (WPS-VG1-PCL) supports real-time tracing and historical tracing. Trace data can be stored in the memory even while the power is off. (With 22 kW or lower power loaders, support is possible as an option [memory back-up battery].)

Multifunctional the Keypad

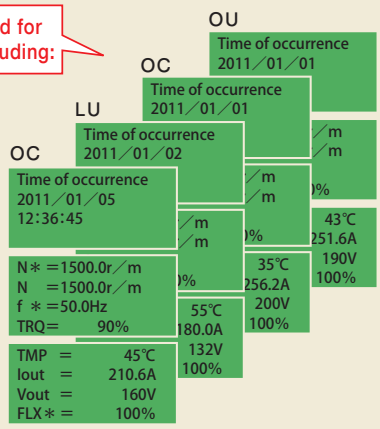
- Wide 7-segment LED ensures easy view.
- The back-light is incorporated in the LCD panel, which enables the easy inspection in the dark control panel.
- Enhanced copy function
  The function codes can be copied to other inverters easily. (Three patterns of function codes can be stored.) Copying data in advance reduces restoration time when problems occur, by replacing the Keypad when changing the unit.
- Remote control operation is available.
  The Keypad can be remotely operated by extending the cable length at the RJ-45 connector.
- JOG (jogging) operation can be executed using the Keypad.
- The HELP key displays operation guidance.

More reliable functions

Save alarm data

Detailed data are stored for the last four alarms, including:

- Time to sound alarm
- Speed setting value
- Detection speed value
- Torque command value
- Temperature
  (heat sink, internal temperature)
- Accumulated operation time
- Output current detection value
- Magnetic-flux reference value
- I/O status



- The number of alarm data to be stored has been increased from the conventional model.
  Thanks to the real-time clock function built-in as standard, the complete data of the latest and last 3 alarm occurences is stored: time, speed command, torque, current and others. This enables machine units to be checked for abnormalities.

⇒As for previous model, new alarm data overwrote and deleted existing alarm data. This is solved with the new VG model.

Alarm severity selection

Alarm severity (serious and minor) can be selected, eliminating the risk of critical facility stoppage due to a minor fault.

	30-relay output	Y-terminal output	Inverter output	Selection
Motor overload, communications error, DC fan lock, etc.	No output (minor fault)	Provided	Operation continued	Can be selected for each function.
	Output	Not provided	Shut off	
Blown fuse, excessive current, ground fault, etc.	Output	Not provided	Shut off	Fixed

PG fault diagnosis

- The PG interface circuit incorporated as standard detects disconnection of the power supply line as well as the PG signal line.
- Operation can be continued in sensorless mode during PG disconnection or fault. (Soon to be supported)
  Old model: The inverter was stopped by a trip and the motor ran freely.
  New model: The mode is automatically switched to sensorless vector control mode when a PG fault is detected, minimizing effect to the machined products.
  (Sensorless control shows lower control performance than vector control with a speed sensor. Combine equipment and machines to be used and check their operation in advance for insufficient torque at low speed, etc.)
- A mode was added that judges if it is a PG fault or a fault on the inverter side
  Simulated output mode is provided at the PG pulse output terminal (FA and FB). Operation can be checked by connecting this to the PG input terminal.

Easy change of the cooling fan

Unit Type

The cooling fan can easily be changed without removing the front cover and printed board.

Inverter body

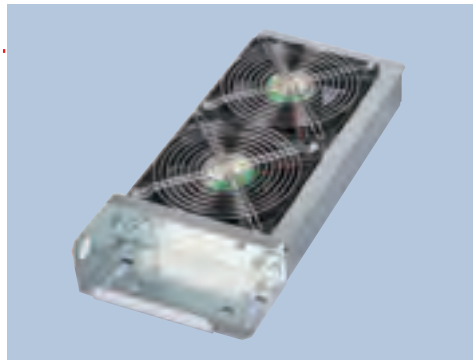
Fan body

Stack Type

The cooling fan installed at the top can easily be changed without drawing the stacks. However, for the 220 to 315kW inverter, remove the 2 connection bars from the DC side and change the cooling fan.

Inverter body

Fan body



Components with a longer service life

For the various consumable parts inside the inverter, their designed lives have been extended to 10 years.
This also extended the equipment maintenance cycles.

Life conditions

Ambient temperature: 40°C*2, load factor: 100% (HD spec), 80% (MD and LD specs)

*1) The planned life is determined by calculation, and is not the guaranteed value.
*2) For the stack type, the ambient temperature is 30°C.

Life-limited component	Design lifetime*1
Cooling fan	10 years
Smoothing capacitor on main circuit	
Electrolytic capacitors on PCB	

Enhanced lifetime alarm

- Lifetime alarms can be checked rapidly on the Keypad and PC loader (optional).
- Facility maintenance can be performed much easier thanks to lifetime alarms.

Items			
Inverter accumulated time (h)	No. of inverter starts (times)	Facility maintenance warning Accumulated time (h) No. of starts (times)	Inverter lifetime alarm information is displayed.

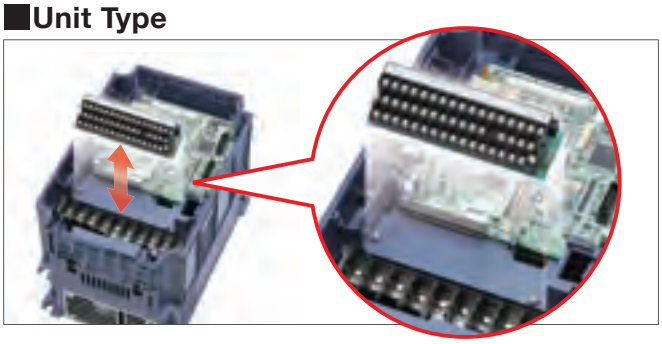
Useful functions for test run and adjustment

- Customization of functions for test run and adjustment (Individual items on the loader can be set to be displayed or not.)
- Each communications I/O map input/output status is displayed (for PLC software debug) on the loader or the keypad (keypad to be supported soon).
- Simulated fault alarm issued by a special function on the Keypad
- Monitor data hold function
- Simulated operation mode
  Simulated connection allows the inverter to be operated with internal parts in the same way as if they were connected to the motor, without actually being connected.
- The externally input I/O monitor and PG pulse states can be checked on the Keypad.
- ASR auto tuning (to be supported soon on the keypad).

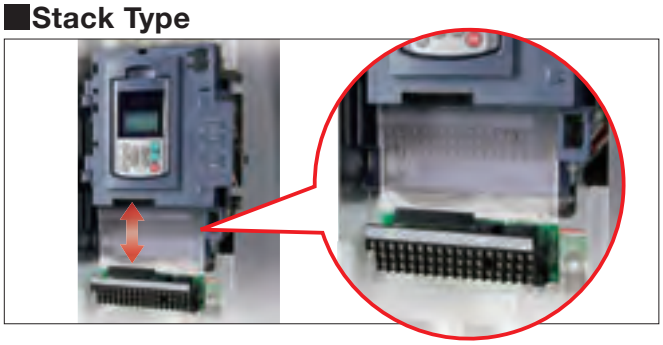
Easy wiring (removable control terminal block)

- The terminal block can be connected to the inverter after control wiring work is completed. Wiring work is simplified.
- Restoration time for updating equipment, problem occurrence, and inverter replacement has been drastically reduced. Just mount the wired terminal block board to the replaced inverter.

Unit Type



Stack Type



Adaptation to Environment and Safety

Conforms to safety standards (Soon to be supported)

- The functional safety (FS) function STO that conforms to the FS standard EN61800-5-2 is incorporated as standard.
- The FS functions STO, SS1, SLS and SBC that conform to FS standard EN61800-5-2 can be also available by installing the option card OPC-VG1-SAFE. (Available only when controlling the motor using feedback encoder (closed loop).)

Safety function STO: Safe Torque Off
This function shuts off the output of the inverter (motor output torque) immediately.

Safety function SS1: Safe Stop 1
This function decreases the motor speed to shut down the motor output torque (by STO FS function) after the motor reaches the specified speed or after the specified time has elapsed.

Safety function SLS: Safely Limited Speed
This function prevents the motor from rotating over the specified speed.

Safety function SBC: Safe Brake Control
This function outputs a safe signal of the motor brake control.

Enhanced environmental resistance

Environmental resistance has been enhanced compared to conventional inverters.

(1) Environmental resistance of cooling fan has been enhanced.
(2) Ni and Sn plating are employed on copper bars.

Environmental resistance has been enhanced on the FRENIC-VG compared to conventional models; however, the following environments should be examined based on how the equipment is being used.

a. Sulfidizing gas (present in some activities such as tire manufacturers, paper manufacturers, sewage treatment, and the textile industry)
b. Conductive dust and foreign particles (such as with metal processing, extruding machines, printing machines, and waste treatment)
c. Others: under unique environments not included under standard environments

Contact Fuji before using the product in environments such as those indicated above.

RoHS Directive compliance

FRENIC-VG complies with European regulations that limit the use of specific hazardous substances (RoHS) as a standard.

Six hazardous substances

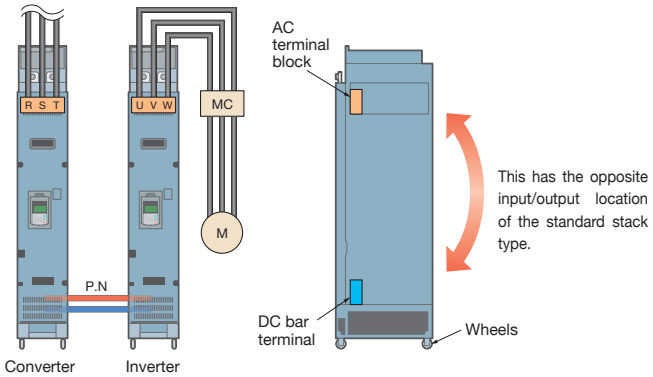
Lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyl (PBB), polybrominated diphenyl ether (PBDE)
*Does not apply to the parts of some inverter models.

About RoHS

Directive 2002/95/EC, promulgated by the European Parliament and European Council, limits the use of specific hazardous substances included in electrical and electronic devices.

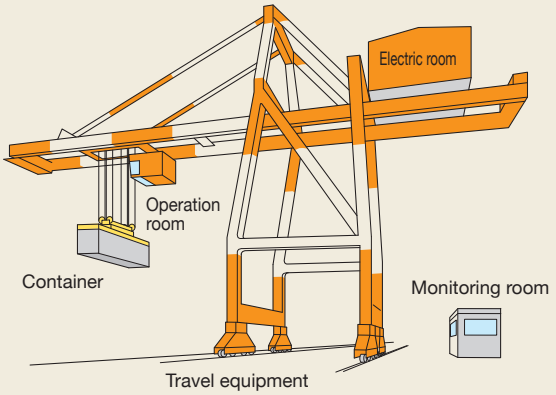
Input/output terminal inverting stack type

If there is no space on the lower side, an input/output inverting stack type is available, with the motor terminals located on the upper side and the DC bus terminals located on the lower side (only for the 220kW inverter). Contact us for specific details



Application Examples

Large crane and overhead crane



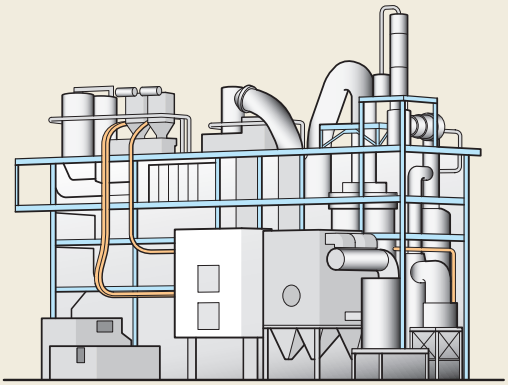
High reliability

VG supports your facility with long life service and high reliability.
The trace back function allows easy fault diagnosis.

Bus system support

The bus system is supported to allow centralized control of elevation, traverse, and trolley, as well as centralized monitoring of running conditions.

Application to plants



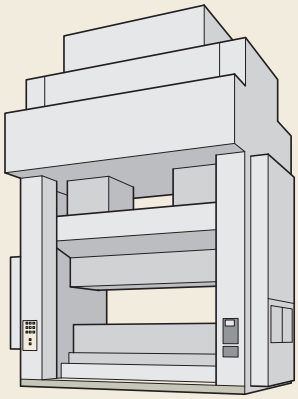
Control with high speed and high accuracy

In addition to high speed and high accuracy, VG contributes to stable facility operation with high reliability and long service life. The trace back function makes diagnosing the cause of problems easy when an abnormality arises.

Bus system support

Centralized control and monitoring are achieved by supporting various fieldbuses.

Servo press: large size for automobiles, small size for machines such as crimping terminal processing machines



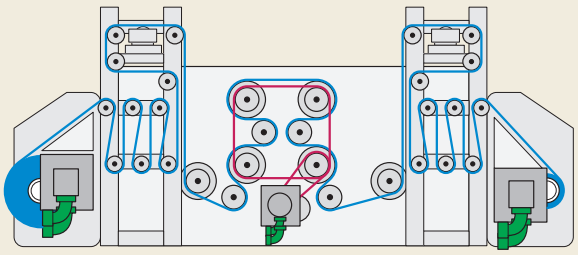
Position control

The press position is controlled based on an instantaneous position command given by the upper order CNC.
Control with high responsibility contributes to shortening of the operation cycle.

Precision synchronization control

Large machines are driven with several motors to increase thrust. Precision synchronization control of several inverters and motors using the high-speed bus system can be applied.

Winding equipment (paper and metal)



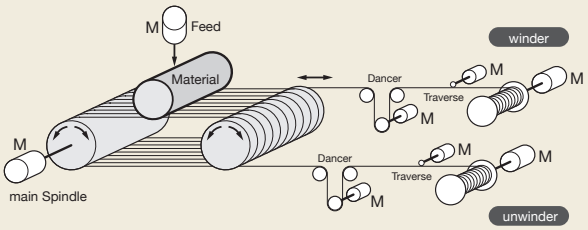
Tension control

Tension-type winding control capability with high accuracy torque control has been improved.
Dancer-type winding control capability by the speed control with high speed response has been improved.

System support

The controller that calculates winding diameter achieves constant tension control.

Feeding part of semiconductor manufacturing device, wire saw



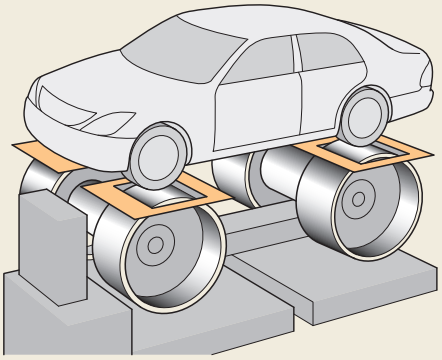
Smooth torque characteristic

The smooth drive characteristic in which torque ripple is suppressed contributes to machining quality.

System support

The system becomes more simple and highly efficient by using same bus system for main axis (spindle) and the other axes (traverse and winding) driven by small capacity servos.

Test equipment for automobiles



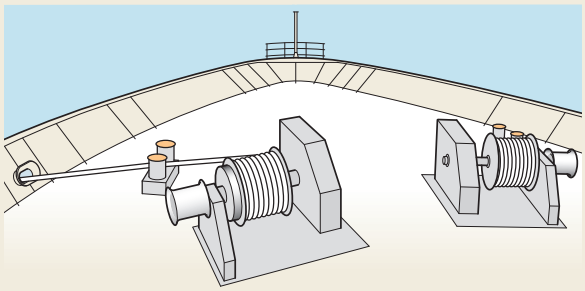
High-speed response control

High-speed rotation and torque control with high response are available for engine and transmission tests.

System support

The system can be supported in cases such as the vehicle body inertia simulation function for a brake test apparatus by combining with the controller.

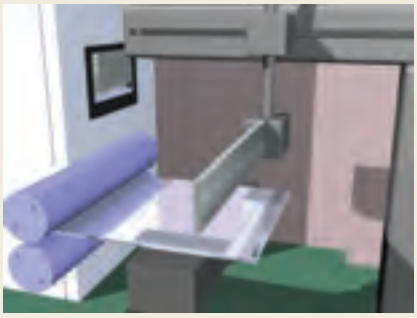
Shipboard winch



High reliability and tension control

Torque is controlled up to extra low speed using the sensorless feature.
Stable drive is maintained against load variation caused by waves.

Flying shear (Cutting while moving)



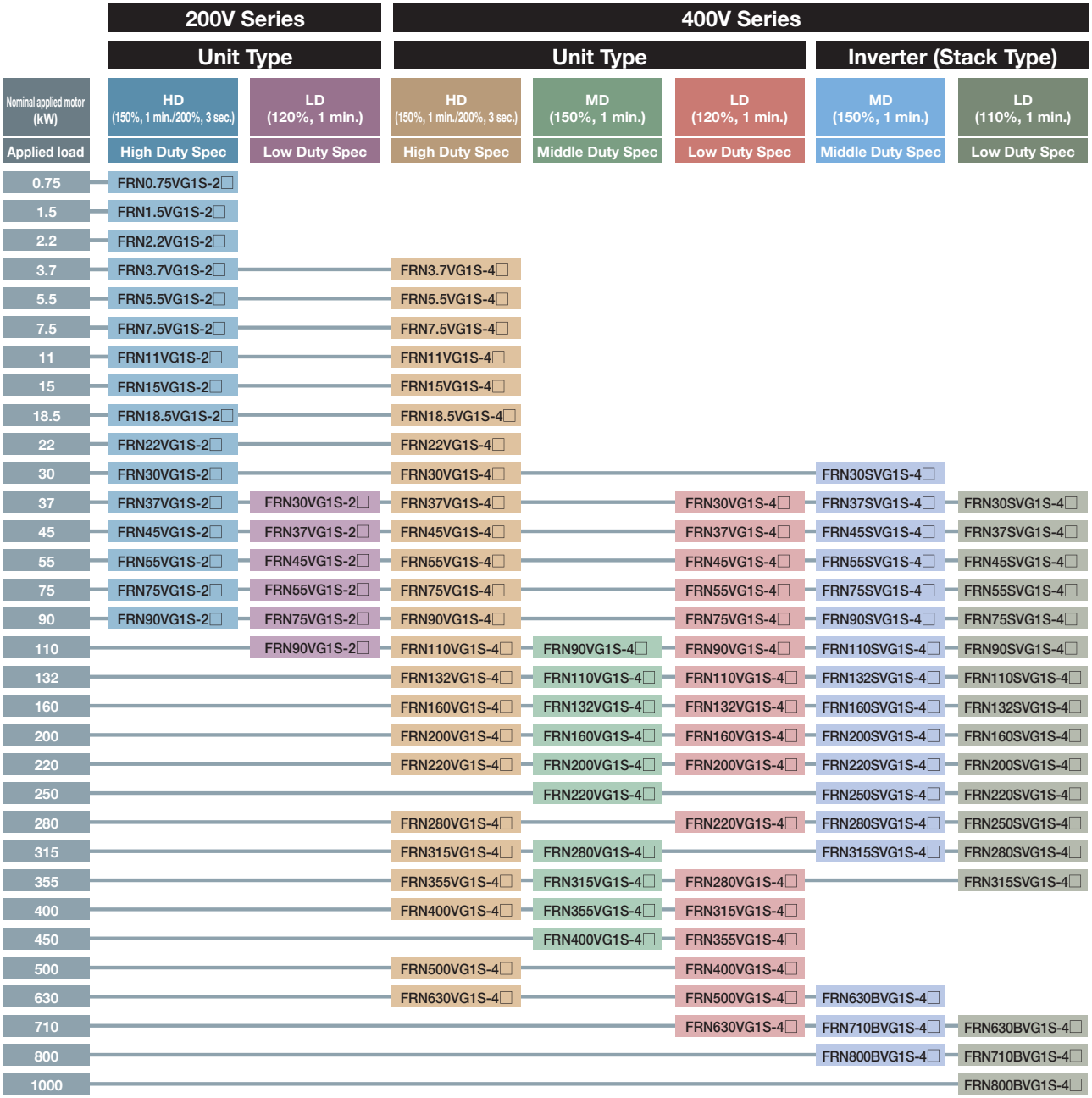
Position control

Position control is performed according to the position command given by the upper order CNC.
The machine cuts the material while moving at the same speed (as the material).

System support

The system is configured by an upper controller that calculates synchronous operation between the material feed axis, cutter feed axis and cut axis.

Model variation (Inverter)



How to read the model number

FRN 30 S VG 1 S – 4 J

Code	Series name
FRN	FRENIC Series

Code	Nominal applied motor capacity
0.75	0.75kW
1.5	1.5kW
2.2	2.2kW
≀	≀
800	800kW

Code	Form
None	Unit type
S	Standard stack
B	Stack by phase

Code	Destination / Instruction Manual
J	Japanese
E	English
C	Chinese

Code	Input power source
2	Three-phase 200V
4	Three-phase 400V

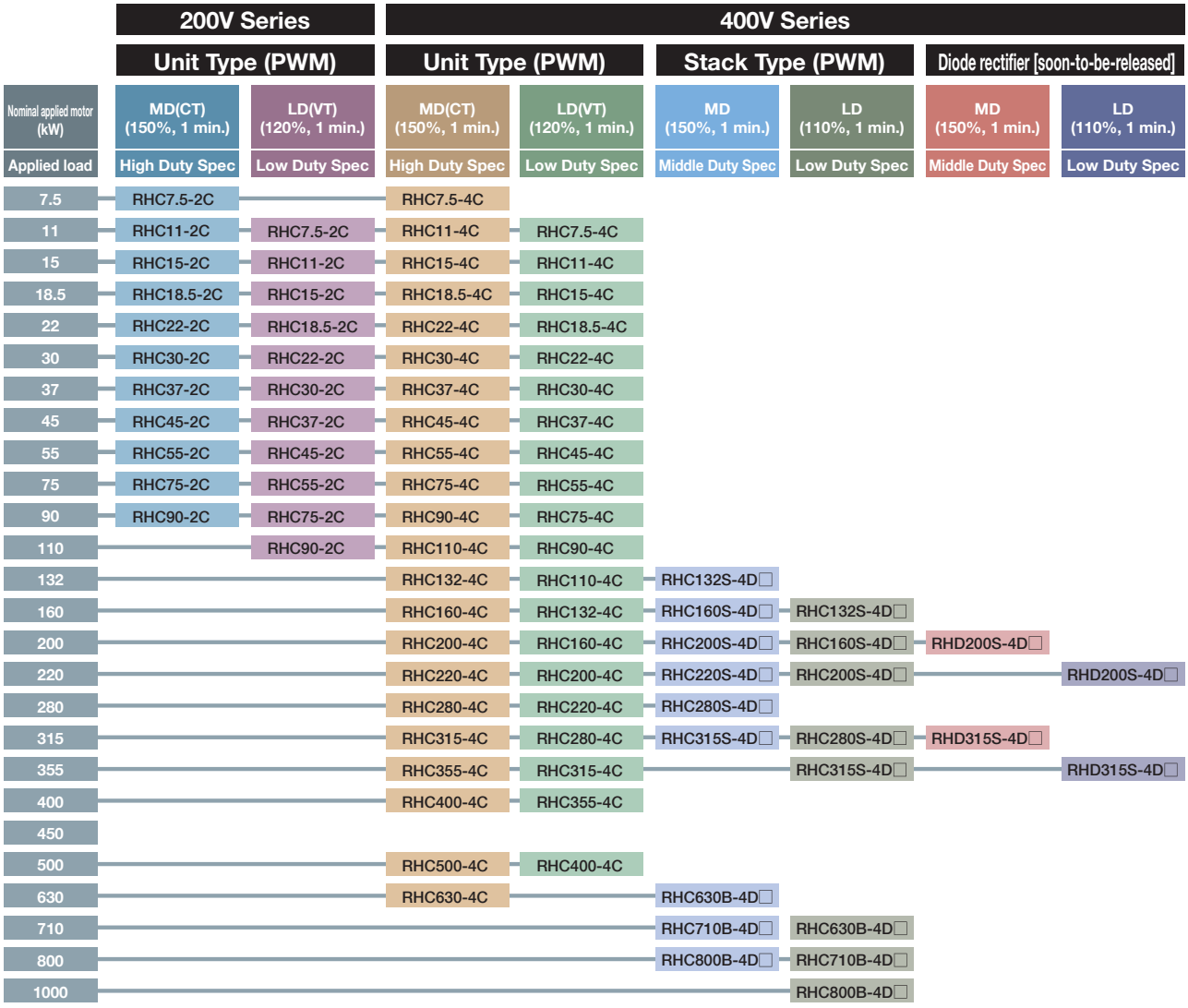
Code	Structure
S	Standard

Code	Developed inverter series
1	1 Series

Code	Application range
VG	High performance vector control

Caution! The product detail described in this document is intended for selecting a model. When using a product, read the Instruction Manual carefully and use the product properly.

Model variation (converter)



Description of converter type

RHC 315 S – 4 D J

Code	Series name
RHC	PMW converter
RHD	Diode rectifier

Code	Nominal applied motor capacity
132	132kW
⌇	⌇
800	800kW

Code	Form
None	Unit type
S	Standard stack
B	Stack by phase

Code*	Destination / Instruction Manual
J	Japanese
E	English
C	Chinese

* This item is available only with the D series.

Code	Developed inverter series
C	C Series
D	D Series

Code	Input power source
2	Three-phase 200V
4	Three-phase 400V

Caution! The product detail described in this document is intended for selecting a model. When using a product, read the Instruction Manual carefully and use the product properly.

Standard specifications

HD specification for heavy overload (Unit Type)

Three-phase 200V series

Type FRN□VG1S-2J		0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90
Nominal applied motor [kW]		0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90
Rated capacity [kVA] (*1)		1.9	3.0	4.1	6.8	10	14	18	24	28	34	45	55	68	81	107	131
Rated current [A]		5	8	11	18	27	37	49	63	76	90	119	146	180	215	283	346
Overload current rating		150% of rated current -1min. (*2), 200% -3s(*3)															
Power supply voltage	Main power Phase, Voltage, Frequency	3-phase 200 to 230V, 50Hz/60Hz										3-phase 200 to 220V/50Hz, 200 to 230V/60Hz (*4)					
	Auxiliary control power supply Phase, Voltage, Frequency	Single-phase 200 to 230V, 50Hz/60Hz															
	Auxiliary input for fan power Phase, Voltage, Frequency (*5)	–											Single phase 200 to 220V, 50Hz 200 to 230V/60Hz (*4)				
	Voltage/frequency variation	Voltage: +10 to -15% (Voltage unbalance: 2% or less (*6)), Frequency: +5 to -5%															
	Rated current [A] (*7) (with DCR)	3.2	6.1	8.9	15.0	21.1	28.8	42.2	57.6	71.0	84.4	114	138	167	203	282	334
	(without DCR)	5.3	9.5	13.2	22.2	31.5	42.7	60.7	80.1	97.0	112	151	185	225	270	–	–
	Required power supply capacity [kVA] (*8)	1.2	2.2	3.1	5.2	7.4	10	15	20	25	30	40	48	58	71	98	116
Braking method /braking torque		Braking resistor discharge control: 150% braking torque, Separately installed braking resistor (option), Separately installed braking unit (option for FRN200VG1S-4J or higher)															
Carrier frequency [kHz] (*9)		2 to 15														2 to 10	
Approx.weight [kg]		6.2	6.2	6.2	6.2	6.2	6.2	11	11	11	12	25	32	42	43	62	105
Protective structure		IP20 closed type										IP00 open type (IP20 closed type is available as option)					

Three-phase 400V series

Type FRN□VG1S-4J		3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	132	160	200	220	280	315	355	400	500	630
Nominal applied motor [kW]		3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	132	160	200	220	280	315	355	400	500	630
Rated capacity [kVA] (*1)		6.8	10	14	18	24	29	34	45	57	69	85	114	134	160	192	231	287	316	396	445	495	563	731	891
Rated current [A]		9.0	13.5	18.5	24.5	32.0	39.0	45.0	60.0	75.0	91.0	112	150	176	210	253	304	377	415	520	585	650	740	960	1170
Overload current rating		150% of rated current -1min. (*2) 200% -3s. (*3)																							
Power supply voltage	Main power Phase, Voltage, Frequency	3-phase 380 to 480V, 50Hz/60Hz											3-phase 380 to 440V/50Hz, 380 to 480V/60Hz (*4)												
	Auxiliary control power supply Phase, Voltage, Frequency	Single phase 380 to 480V, 50Hz/60Hz																							
	Auxiliary input for fan power Phase, Voltage, Frequency (*5)	–											Single phase 380 to 440V, 50Hz 380 to 480V/60Hz (*4)												
	Voltage/frequency variation	Voltage: +10 to -15% (Voltage unbalance: 2% or less (*6)), Frequency: +5 to -5%																							
	Rated current [A] (*7) (with DCR)	7.5	10.6	14.4	21.1	28.8	35.5	42.2	57.0	68.5	83.2	102	138	164	210	238	286	357	390	500	559	628	705	881	1115
	(without DCR)	13.0	17.3	23.2	33	43.8	52.3	60.6	77.9	94.3	114	140	–	–	–	–	–	–	–	–	–	–	–	–	–
	Required power supply capacity [kVA] (*8)	5.2	7.4	10	15	20	25	30	40	48	58	71	96	114	140	165	199	248	271	347	388	436	489	610	773
Braking method /braking torque		Braking resistor discharge control: 150% braking torque, Separately installed braking resistor (option), Separately installed braking unit (option for FRN200VG1S-4J or higher)																							
Carrier frequency [kHz] (*9)		2 to 15											2 to 10											2 to 5	
Approx.weight [kg]		6.2	6.2	6.2	11	11	11	11	25	26	31	33	42	62	64	94	98	129	140	245	245	330	330	555	555
Protective structure		IP20 closed type							IP00 open type (IP20 closed type is available as option)																

Note 1) The specification above are established when the function code F80 = 0 (HD specification) is applied.
When used with the HD specification with 75kW or higher, DC reactor is necessary (to be ordered separately from inverter unit based on the rating)

*1) The rated output voltage is 220V for 200V series and 440V for 400V series.

*2) When the inverter output frequency converter value is 10Hz or less, the inverter may trip early due to overload depending on the conditions such as ambient temperature.

*3) When the inverter output frequency converter value is 5Hz or less, the inverter may trip early due to overload depending on the conditions such as ambient temperature.

*4) 200V series: Make an individual order for 220 to 230V/50Hz.
400V series: The inverters with the power supply of 380 to 398V/50Hz and 380 to 430V/60Hz must be switched using a connector inside the inverter.
The output of the inverter with 380V may drop depending on situations.For the detail, refer to the FRENIC-VG User Manual chapter 10.5.

*5) The auxiliary power input is used as an AC fan power input when combining the unit such as high power factor PWM converter with power regenerative function.(Generally not used.)

*6) Voltage unbalance [%] = $\frac{\text{Max. voltage [V] - Min. voltage [V]}}{\text{Three-phase average voltage [V]}} \times 67$

Use an AC reactor if the voltage unbalance exceeds 2%.

*7) The value is calculated on assumption that the inverter is connected with a power supply capacity of 500kVA (or 10 times the inverter capacity if the inverter capacity exceeds 50kVA) and %X is 5%.

*8) This shows values when the DC reactor is used. (Optional for 55kW or less model)

*9) The inverter may automatically reduce carrier frequency in accordance with ambient temperature or output current in order to protect itself.

MD specification for middle overload (Unit Type)

Three-phase 400V series

Type FRN□VG1S-4J		90	110	132	160	200	220	280	315	355	400
Nominal applied motor [kW] (*8)		110	132	160	200	220	250	315	355	400	450
Rated capacity [kVA] (*1)		160	192	231	287	316	356	445	495	563	640
Rated current [A]		210	253	304	377	415	468	585	650	740	840
Overload current rating		150% of rated current -1min. (*2)									
Power supply voltage	Main power Phase, Voltage, Frequency	3-phase 380 to 440V/50Hz, 380 to 480V/60Hz (*3)									
	Auxiliary control power supply Phase, Voltage, Frequency	Single phase 380 to 480V, 50Hz/60Hz									
	Auxiliary input for fan power Phase, Voltage, Frequency (*4)	Single phase 380 to 440V, 50Hz 380 to 480V/60Hz (*3)									
	Voltage/frequency variation	Voltage: +10 to -15% (Voltage unbalance: 2% or less (*5)), Frequency: +5 to -5%									
	Rated current [A] (*6) (with DCR)	210	238	286	357	390	443	559	628	705	789
	(without DCR)	–									
	Required power supply capacity [kVA] (*7)	140	165	199	248	271	312	388	436	489	547
Braking method /braking torque		Braking resistor discharge control: 150% braking torque, Separately installed braking resistor (option)				Braking resistor discharge control: 150% braking torque, Separately installed braking resistor (option) Separately installed braking unit (option)					
Carrier frequency [kHz]		2									
Approx.weight [kg]		62	64	94	98	129	140	245	245	330	330
Protective structure		IP00 open type (IP20 closed type is available as option)									

Note 1) The specifications above are established when the function code F80 = 3 (MD specification) is applied.
When used with the MD specification with 90kW or higher, DC reactor is necessary (to be ordered separately from inverter unit based on the rating)

*1) When the rated output voltage is 440V

*2) When the converted inverter output frequency is less than 1Hz, the inverter may trip earlier in some ambient temperature conditions if the motor is overloaded

*3) When the power supply is 380 to 398V at 50 Hz or 380 to 430V at 60Hz, a connector inside the inverter must be reconnected accordingly.
The output of the inverter with 380V may drop depending on situations.For the detail, refer to the FRENIC-VG User Manual 10.5.

*4) The auxiliary power input is used as an AC fan power input when combining the unit such as high power factor PWM converter with power regenerative function.(Generally not used.)

*5) Voltage unbalance [%] = $\frac{\text{Max. voltage [V] - Min. voltage [V]}}{\text{Three-phase average voltage [V]}} \times 67$

Use an AC reactor if the voltage unbalance exceeds 2%.

*6) The value is calculated on assumption that the inverter is connected with a power supply capacity of 10 times the inverter capacity and %X is 5%.

*7) This shows values when the DC reactor is used.

*8) Since heat generation of the motor due to low carrier may be increased depending on the load condition, designate the MD specification when ordering the motor.

Standard specifications

LD specifications for light overload (Unit Type)

Three-phase 200V series

Type FRN□VG1S-2J		30	37	45	55	75	90
Nominal applied motor [kW]		37	45	55	75	90	110
Rated capacity [kVA] (*1)		55	68	81	107	131	158
Rated current [A]		146	180	215	283	346	415
Overload current rating		120% of rated current -1min. (*2)					
Power supply voltage	Main power Phase, Voltage, Frequency	3-phase 200 to 220V/50Hz, 200 to 230V/60Hz (*3)					
	Auxiliary control power supply Phase, Voltage, Frequency	Single phase 200 to 230V,50Hz/60Hz					
	Auxiliary input for fan power Phase, Voltage, Frequency (*4)	–	Single phase 200 to 230V, 50Hz 200 to 230V, 60Hz (*3)				
	Voltage/frequency variation	Voltage: +10 to -15% (Voltage unbalance: 2% or less (*5)), Frequency: +5 to -5%					
	Rated current [A] (*6) (with DCR)	138	167	203	282	334	410
	Rated current [A] (*6) (without DCR)	185	225	270	–	–	–
	Required power supply capacity [kVA] (*7)	48	58	71	98	116	143
Braking method /braking torque		Braking resistor discharge control: 110% braking torque, Separately installed braking resistor (option), Separately installed braking unit (option for FRN75VG1S-2J or higher)					
Carrier frequency [kHz] (*8)		2 to 10				2 to 5	
Approx.weight [kg]		25	32	42	43	62	105
Protective structure		IP00 open type (IP20 closed type is available as option)					

Three-phase 400V series

Type FRN□VG1S-4J		30	37	45	55	75	90	110	132	160	200	220	280	315	355	400	500	630
Nominal applied motor [kW]		37	45	55	75	90	110	132	160	200	220	280	355	400	450	500	630	710
Rated capacity [kVA] (*1)		57	69	85	114	134	160	192	231	287	316	396	495	563	640	731	891	1044
Rated current [A]		75	91	112	150	176	210	253	304	377	415	520	650	740	840	960	1170	1370
Overload current rating		120% of rated current -1min. (*2)																
Power supply voltage	Main power Phase, Voltage, Frequency	3-phase 380 to 480V, 50Hz/60Hz				3-phase 380 to 440V/50Hz, 380 to 480V/60Hz (*3)												
	Auxiliary control power supply Phase, Voltage, Frequency	Single phase 380 to 480V, 50Hz/60Hz																
	Auxiliary input for fan power Phase, Voltage, Frequency (*4)	–				Single phase 380 to 440V, 50Hz 380 to 480V, 60Hz (*3)												
	Voltage/frequency variation	Voltage: +10 to -15% (Voltage unbalance: 2% or less (*5)), Frequency: +5 to -5%																
	Rated current [A] (*6) (with DCR)	68.5	83.2	102	138	164	210	238	286	357	390	500	628	705	789	881	1115	1256
	Rated current [A] (*6) (without DCR)	94.3	114	140	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Required power supply capacity [kVA] (*7)	48	58	71	96	114	140	165	199	248	271	347	436	489	547	611	773	871
Braking method /braking torque		Braking resistor discharge control: 110% braking torque, Separately installed braking resistor (option), Separately installed braking unit (option for FRN200VG1S-4J or higher)																
Carrier frequency [kHz] (*8)		2 to 10				2 to 5												2
Approx.weight [kg]		25	26	31	33	42	62	64	94	98	129	140	245	245	330	330	555	555
Protective structure		IP00 open type (IP20 closed type is available as option)																

Note 1) The above specifications are for Function Code F80=1 (LD specification).
When used with the LD specification with 55kW or higher, DC reactor is necessary (to be ordered separately from inverter unit based on the rating)

*1) The rated output voltage is 220V for 200V series and 440V for 400V series.

*2) When the converted inverter output frequency is less than 10Hz, the inverter may trip earlier in some ambient temperature conditions if the motor is overloaded.

*3) 200V series: Make an individual order for 220 to 230V/50Hz.
400V series: The inverters with the power supply of 380 to 398V/50Hz and 380 to 430V/60Hz must be switched using a connector inside the inverter.
The output of the inverter with 380V may drop depending on situations.For the detail, refer to the FRENIC-VG User Manual 10.5.

*4) The auxiliary power input is used as an AC fan power input when combining the unit such as high power factor PWM converter with power regenerative function.(Generally not used.)

*5) Voltage unbalance [%] = $\frac{\text{Max. voltage [V] - Min. voltage [V]}}{\text{Three-phase average voltage [V]}} \times 67$

Use an AC reactor if the voltage unbalance exceeds 2%.

*6) The value is calculated on assumption that the inverter is connected with a power supply capacity of 500kVA (or 10 times the inverter capacity if the inverter capacity exceeds 50kVA) and %X is 5%.

*7) This shows values when the DC reactor is used. (Optional for FRN45VG1S-2J and FRN45VG1S-4J or lower model)

*8) The inverter may automatically reduce carrier frequency in accordance with ambient temperature or output current in order to protect itself.

MD specifications for middle overload (Stack Type)

Three-phase 400V series

Type FRN□○V1S-4J		30S	37S	45S	55S	75S	90S	110S	132S	160S	200S	220S	250S	280S	315S	630B(*5)	710B(*5)	800B(*5)
Nominal applied motor [kW]		30	37	45	55	75	90	110	132	160	200	220	250	280	315	630	710	800
Rated capacity [kVA] (*1)		45	57	69	85	114	134	160	192	231	287	316	356	396	445	891	1044	1127
Rated current [A]		60	75	91	112	150	176	210	253	304	377	415	468	520	585	1170	1370	1480
Overload current rating		150% of rated current -1min. (*2)																
Power supply voltage	Main power	Refer to the specifications of PWM converter of DC input type.																
	Auxiliary control power supply Phase, Voltage, Frequency	Single phase 380 to 480V, 50/60Hz																
	Auxiliary input for fan power Phase, Voltage, Frequency	Auxiliary input for fan power					Single phase 380 to 440V, 50Hz 380 to 480V, 60Hz (*3)											
	Voltage/frequency variation	Voltage:+10 to -15%, Frequency:+5 to -5%																
Carrier frequency [kHz] (*4)		2																
Approx. weight [kg]		28	28	28	35	35	43	43	85	85	85	126	126	126	126	126×3(*6)	126×3(*6)	126×3(*6)
Protective structure		IP00 open type																

Note 1) The above specifications are for Function Code F80=3 (MD specification).
*1) When the rated output voltage is 440V
*2) When the converted inverter output frequency is less than 1Hz, the inverter may trip earlier in some ambient temperature conditions if the motor is overloaded.
*3) When the power supply is 380 to 398V at 50 Hz or 380 to 430V at 60Hz, a connector inside the inverter must be reconnected accordingly.
*4) When the synchronous motor is run at a low carrier frequency, the permanent magnet may be over-heated and demagnetized by harmonic components of the output current. Be sure to check the permissible carrier frequency of the motor.
*5) One set of the inverter consists of three stacks.
*6) This weight may be changed.For details, contact the Sales Department at Fuji.

LD specifications for light overload (Stack Type)

Three-phase 400V series

Type FRN□○V1S-4J		30S	37S	45S	55S	75S	90S	110S	132S	160S	200S	220S	250S	280S	315S	630B(*5)	710B(*5)	800B(*5)
Nominal applied motor [kW]		37	45	55	75	90	110	132	160	200	220	250	280	315	355	710	800	1000
Rated capacity [kVA] (*1)		57	69	85	114	134	160	192	231	287	316	356	396	445	495	1044	1127	1409
Rated current [A]		75	91	112	150	176	210	253	304	377	415	468	520	585	650	1370	1480	1850
Overload current rating		110% of rated current -1min. (*2)																
Power supply voltage	Main power	Refer to the specifications of PWM converter of DC input type.																
	Auxiliary control power supply Phase, Voltage, Frequency	Single phase 380 to 480V, 50/60Hz																
	Auxiliary input for fan power Phase, Voltage, Frequency	Auxiliary input for fan power					Single phase 380 to 440V, 50Hz 380 to 480V, 60Hz (*3)											
	Voltage/frequency variation	Voltage:+10 to -15%, Frequency:+5 to -5%																
Carrier frequency [kHz] (*4)		2																
Approx. weight [kg]		28	28	28	35	35	43	43	85	85	85	126	126	126	126	126×3(*6)	126×3(*6)	126×3(*6)
Protective structure		IP00 open type																

Note 1) The above specifications are for Function Code F80=1 (LD specification).
*1) When the rated output voltage is 440V
*2) When the converted inverter output frequency is less than 1Hz, the inverter may trip earlier in some ambient temperature conditions if the motor is overloaded.
*3) When the power supply is 380 to 398V at 50 Hz or 380 to 430V at 60Hz, a connector inside the inverter must be reconnected accordingly. If using another voltage, contact Fuji.
*4) When the synchronous motor is run at a low carrier frequency, the permanent magnet may be over-heated and demagnetized by harmonic components of the output current. Be sure to check the permissible carrier frequency of the motor.
*5) One set of the inverter consists of three stacks.
*6) This weight may be changed. For details, contact the Sales Department at Fuji.

Common items

Common specifications for inverters

Item				Unit Type	Stack Type
Control	Motor control method	For induction motor		Vector control with speed sensor Speed sensorless vector control V/f control	Vector control with speed sensor Speed sensorless vector control V/f control
		For synchronous motor		Vector control with speed sensor (including magnetic pole position detection)	
		Test mode		Simulated operation mode	
Induction motor control	Vector control with speed sensor	Setting resolution	Speed setting	Analog setting: 0.005% of max. speed Digital setting: 0.005% of max. speed	
			Torque setting Torque current setting	0.01% of rated torque	
		Control accuracy	Speed	Analog setting: ±0.1% of max. speed (25±10°C) Digital setting: ±0.005% of max. speed (-10 to 50°C)	Analog setting: ±0.1% of max. speed (25±10°C) Digital setting: ±0.005% of max. speed (-10 to 40°C)
			Torque	±3% of rated torque (with dedicated motor)	
		Control response	Speed	600Hz *1	100Hz
		Maximum speed		800Hz by inverter output frequency conversion *1	150Hz by inverter output frequency conversion
		Speed control range		1:1500 When the base speed is 1500 r/min, 1 to 1500 r/min to max. speed (with no. of PG pulses is 1024P/R) 1:6 (constant torque range: constant output range)	
Induction motor control	Speed sensorless vector control	Setting resolution	Speed setting	Analog setting: ±0.005% of max. speed Digital setting: ±0.005% of max. speed	
			Torque setting Torque current setting	0.01% of rated torque	
		Control accuracy	Speed	Analog setting: ±0.1% of max. speed (25±10°C) Digital setting: ±0.1% of max. speed (-10 to 50°C)	Analog setting: ±0.1% of max. speed (25±10°C) Digital setting: ±0.1% of max. speed (-10 to 40°C)
			Torque	±5% of rated torque	
		Control response	Speed	40Hz *1	20Hz
		Maximum speed		500Hz by inverter output frequency conversion *1	150Hz by inverter output frequency conversion
		Speed control range		1:250 When the base speed is 1500 r/min, 6 to 1500 r/min to max. speed 1:4 (constant torque range: constant output range)	
	V/f control	Setting resolution		Analog setting: 0.005% of max. speed Digital setting: 0.005% of max. speed	
		Output frequency control accuracy		Analog setting: ±0.2% of max. output frequency (25±10°C) Digital setting: ±0.01% of max. output frequency (-10 to 50°C)	Analog setting: ±0.2% of max. output frequency (25±10°C) Digital setting: ±0.01% of max. output frequency (-10 to 40°C)
		Maximum frequency		500Hz	150Hz
		Control range		0.2 to 500Hz 1:4 (constant torque range: constant output range)	0.2 to 150Hz 1:4 (constant torque range: constant output range)
Synchronous motor control	Vector control with speed sensor	Setting resolution	Speed setting	Analog setting: 0.005% of max. speed Digital setting: 0.005% of max. speed	
			Torque setting	0.01% of rated torque	
		Control accuracy	Speed	Analog setting: ±0.1% of max. speed (25±10°C) Digital setting: ±0.005% of max. speed (-10 to 50°C)	Analog setting: ±0.1% of max. speed (25±10°C) Digital setting: ±0.005% of max. speed (-10 to 40°C)
			Torque	±3% of rated torque (with dedicated motor)	
		Response control	Speed	600Hz *1	100Hz
		Maximum speed		800Hz by inverter output frequency conversion *1	150Hz by inverter output frequency conversion

*1: Maximum value. This value may not be reached depending on the carrier frequency settings.

Item			Unit Type	Stack Type
Synchronous motor control	Vector control with speed sensor	Speed control range	1:1500 (with no. of PG pulses is 1024P/R) When the base speed is 1500 r/min, 1 to 1500 r/min to max. speed	
Control	Running and operation		KEYPAD operation: CW or CCW operation by FWD or REV key, and STOP key Digital input signal operation: FWD or REV command, coast-to-stop command, reset input, multistep speed selection command, etc.	
	Speed setting		KEYPAD operation : ▲ or ▼ key Setting resistor :Potentiometers (variable resistors) (three terminals:1 to 5kΩ) Analog input :0 to ±10V, 4 to 20mA UP/DOWN control :Speed increases when UP signal (DI) is ON, and decreases when DOWN signal (DI) is ON. Multistep speed :Up to 15 different speeds can be selected by combining four external input signals (DI). Digital signal :Can be set by "16-bit parallel signals" available by the option card. Serial link operation :RS-485 (standard). Setting through different communication options is possible. Jogging operation : FWD or REV key, or FWD or REV terminals in jogging mode	
	Speed detection		Induction motor :+15V, +12V complimentary output PG (insulated) / max. receivable frequency: 100kHz :+5V line driver output PG (insulated): with option card OPC-VG1-PG installed / max. receivable frequency: 500kHz Synchronous motor :+5V line driver output PG (insulated): with option card OPC-VG1-PMPG installed / max. receivable frequency: 100kHz :ABS encoder with 17-bit high resolution (TS5667N253: made by Tamagawa Seiki) with option card OPC-VG1-SPGT installed	
	Speed control		The PI calculation w/ feed forward term is performed. Control parameter switchover The control parameter can be switched by external signals	
	Running status signal		Transistor output: Inverter running, Speed equivalence, Speed detection, inverter overload early warning, torque limiting, etc. Analog output: Motor speed, Output voltage, Torque, Load factor, etc.	
	Acceleration/Deceleration time		0.01 to 3600s (4 independent settings for acceleration and deceleration selectable with external signals) (S-curve acceleration/deceleration in addition to linear acceleration/deceleration)	
	Gain for speed setting		Sets the proportional relationship between analog speed setting and motor speed in the range of 0 to 200%.	
	Jump speed		Jump speed (3 points) and jump width (1 point) can be set.	
	Rotating motor pick up (Flying start)		A rotating motor can be smoothly picked up by the inverter without stopping.	
	Auto-restart after momentary power failure		Automatic restart is available without stopping the motor after a momentary power failure.	
	Slip compensation control		Compensates for the decrease of speed due to load and realizes stable operation (by V/f control w/ induction motor).	
	Droop control		The motor speed droops in proportion to output torque (disabled with V/f control).	
	Torque limiting		Limits the torque to predetermined values (selectable from "common to 4 quadrants", "independent driving and braking", etc.) Analog and external signal (2 steps) settings are available.	
	Torque control		Analog setting: 0 to ±10V /0 to ±150% (up to 300% by gain adjustment) Digital setting: A "16-bit parallel signal" setting is available using an optional card.	
	PID control		Analog input by PID control is possible.	
	Cooling fan ON/OFF control		Cooling fan is stopped during motor stoppage and low temperature to elongate the cooling fan life and reduce cooling fan noise.	
	Toggle monitor control		Monitors that the communications between the host device (PLC) and the inverter are working properly.	
	Torque bias		Internal setting (3 steps) and analog setting (hold function) are enabled by combining the fixed values (1 step, polarity switching by motor rotation direction function) and external signal (DI signal).	

Common items

Item			Unit Type	Stack Type
Control	Motor selection		Motor can be selected from three types by using (F79) or by combining the external signals (DI signals).	
	Temperature detection		NTC thermistor (Fuji Electric product or equivalent item) PTC thermistor (Trip level set by parameter) (for motor overheat protection)	
	PG detection circuit self diagnosis		Self-diagnosis for detection circuit of the pulse encoder input signal (PA, PB)	
	Load adaptive control function		Running efficiency of the unit can be improved by calculating the max. elevation speed achieved by the weight for a vertical transfer unit or other similar units.	
	Multiple winding motor drive		Option: Use of OPC-VG1-TBSI Maximum number of motor windings: 6 Control specification: Only vector control with a speed sensor is available.	
	Direct parallel connection system		Option: Use of OPC-VG1-TBSI Maximum number of parallel modules: 3 There are restrictions on the conditions of use, such as output wiring length. For details, refer to the User Manual.	
	UP/DOWN control		Speed setting is possible by combining the UP command, DOWN command, and zero clear command using the external signal (DI signal).	
	Stopping function		3 types of stopping functions: STOP 1, 2 and 3.	
	PG pulse output		Outputs the input pulse such as a motor PG signal by fixed or free frequency dividing. Open collector and complimentary (same voltage as PGP terminal) can be switched by setting the unit internal switch.	
	Observer		Suppresses load disturbances and vibrations.	
	Off-line tuning		Rotary type and non-rotary type are available for tuning the motor constants.	
	On-line tuning		Used for tuning continuosly motor constants due to the motor temperature change.	
	Position control		Standard function: position control by servo lock and built-in transmitting circuit. Options: OPC-VG1-PG (PR) : for line driver type pulse command input OPC-VG1-PGo (PR) : for open collector type pulse command input	
	Pulse train synchronous operation		Options: OPC-VG1-PG (PR) : for line driver type pulse command input OPC-VG1-PGo (PR) : for open collector type pulse command input	
Display and setting	Keypad	Display	7-segment LED, LCD with backlight	
		Language display	Japanese, English, Chinese, Korean (French, Spanish, German, and Italian *1)	
		Running/stopping	• Detected speed value • Speed reference value • Output frequency • Torque current reference value • Torque reference value • Torque calculation value • Power consumption (motor output) • Output current • Output voltage • DC link circuit voltage • Magnetic-flux reference value • Magnetic-flux calculation value • Load shaft speed • PID reference value • PID feedback value • PID output value • Ai adjusted value (12) • Ai adjusted value (Ai1) • Ai adjusted value (Ai2) • Optional monitor 1 to 6 • Presence of digital input/output signal • Motor temperature • Heat sink temperature • Load factor • Input power • Integral power consumption • Operation time • Motor accumulated operation time/no. of starts (for each motor), etc.	
		Setting mode	Names and data are displayed.	
		Alarm mode	Displays the following alarm codes; • dbH (Braking resistor overheat)(*) • dCF (DC fuse blown) • EF (Ground fault) • Er1 (Memory error) • Er2 (KEYPAD panel communication error) • Er3 (CPU error) • Er4 (Network error) • Er5 (RS-485 error) • Er6 (Operation procedure error) • Er7 (Output wiring error) • Er8 (A/D converter error) • Er9 (Speed disagreement) • Erb (Inter-inverter communication error) • Lin (Input phase loss)(*) • LU (Undervoltage) • nrb (NTC thermistor disconnection) • OC (Overcurrent) • OH1 (Overheating at heat sink) • OH2 (External alarm input) • OH3 (Inverter internal overheat) • OH4 (Motor overheat) • OL1 (Motor 1 overload) • OL2 (Motor 2 overload) • OL3 (Motor 3 overload) • P9 (PG error) • OLU (Inverter unit overload) • OS (Overspeed) • OU (Overvoltage) • ErH(Hardware error) • PbF (Charging circuit error) (*) • dO (Excessive position deviation) • dbA (Braking transistor abnormal) (*) • EC(Encoder communications error) • Err (Simulated fault) • OPL (Output phase loss detection) • dFA (DC fan lock) • Et1(Encoder error) • LOC (Start stall) • ArF (Toggle error) • ArE (E-SX error)	
		Minor fault	[L-AL] is displayed. Stores and displays the detailed cause that triggers the minor fault.	
		Alarm during running	The latest and last ten pieces of alarm codes and the latest and the last three pieces of alarm detailed data are stored. Stores and displays alarm date and time by the calendar and time display function [accuracy: ±27 sec/month (Ta=25°C)]. Data stored period: 5 years or more (at ambient temperature 25°C) Battery: built-in as standard for 30kW or higher capacity models, available as option for 22kW or lower capacity models.	

*1: This will be available soon.
*) Not available for the stack type

Item			Unit Type	Stack Type
Display and setting	Loader	Historical trace (*1)	Loads sampling data retained in the inverter to display with a graph. Sampling time: 50μs to 1s	
		Real-time trace (*1)	Loads data from the inverter on a real-time basis to display with a graph. Sampling time: 1ms to 1s	
		Trace back	Loads sampling data retained in the inverter at an alarm to display with a graph. Sampling time: 50μs to 1s (Note that sampling is enabled at 400μs or more except current.) Sampling data are stored into the memory using the battery power. Data stored period: 5 years or more (at ambient temperature 25°C) Battery: built-in as standard for 30kW or higher capacity models, available as option for 22kW or lower capacity models.	
		Operation monitor (*1)	I/O monitor, system monitor, alarm history monitor	
		Function code setting	Function code setting states can be checked. Also edit, transfer, comparison, initialization are available.	
	Charge lamp		Lit when the power is being supplied to the inverter body. Lit even with control power.	
Maintenance	Main circuit capacitor life		Auto life judgment function installed	
	Common functions		• Displays and records accumulated time for control PCB capacitor life and cooling fan operation time • Displays and records inverter operation time. • Displays and records the maximum output current and the maximum internal temperature for the past one hour.	
Communications	RS-485		This is a input terminal to connect computers and programmable controllers via RS-485 communications.	
	USB		USB connector (Mini B type) for connection with a computer.The following operations are enabled using the inverter support loader: function code edit, transfer verification, inverter test run, and monitoring various states.	
Compatibility with earlier models	VG7	Function code data	Set the VG7 function codes to activate each operation of the code (excluding the function codes for the VG7 third motor). Values read from the VG7 can be written to the FRENIC-VG without changing them by using the PC loader (except for some special items).	
		Communications	T-Link, SX bus, and CC-Link are fully compatible. The host PLC software can be used without any change (except for some special items).	
	Installation adaptor		An adapter to fit the installation dimensions of earlier models is available as option.	
Safety function	Standard function	Stopping function	Safe Torque Off (STO) • Stops the inverter output transistor by hardware -and therefore stops the output torque of the motor- immediately by turning OFF digital input signals (EN1 terminal or EN2 terminal), which are externally controlled.	
Product standard	Conformance to standard		• US and Canada Safety Standard UL, cUL (UL508C, C22.2 No.14) (Pending certification) • Machinery Directive IEC/EN ISO13849-1: PL-d (Pending certification) IEC/EN60204-1: stop category 0 (Pending certification) IEC/EN61800-5-2: SIL2 (Pending certification) IEC/EN62061: SIL2 (Pending certification) • Low Voltage Directive EN61800-5-1: Over voltage category 3 (Pending certification) • EMC Directive IEC/EN 61800-3(Certification being approved),IEC/EN 61326-3-1(Pending certification) (Emission) EMC filter (Option) : Unit type (220kW or lower) : Category 2 Unit type (280kW or higher) : Category 3 Stack type : Category 3 (Immunity) 2nd Env.	
Installation environment	Usage environment		Indoor use only. Free from corrosive and flammable gases, dusts, and oil mist (pollution degree 2 - IEC60664-1). No direct sunlight.	
	Ambient temperature		-10 to +50°C (-10 to +40°C: In case of 22 kW or lower installed side-by-side without clearance)	-10 to +40°C
	Ambient humidity		5 to 95% RH (No dew condensation allowed)	
	Altitude		3000m or less However, the output may be reduced at the altitude of 1001 to 3000m For use at the altitude of 2001 to 3000m, the insulation class of the control circuit is changed from "Enhanced insulation" to "Basic insulation".	
	Vibration		• 200V 55kW or less, 400V 75kW or less 3mm: 2 to 9Hz or less, 9.8m/s^2: 9 to 20Hz or less, 2m/s^2: 20 to 55Hz or less, 1m/s^2: 55 to 200Hz or less • 200V 75kW or more, 400V 90kW or more 3mm: 2 to 9Hz or less, 2m/s^2: 9 to 55Hz or less, 1m/s^2: 55 to 200Hz or less	0.3mm: 2 to 9Hz 1m/s^2 : 9 to 200Hz
	Storage temperature		-25 to 70°C (-10 to +30°C for long-term storage)	
	Storage humidity		5 to 95% RH (No dew condensation allowed)	

*1) This function is available by the licensed FRENIC VG Loader (WPS-VG1-PCL).

Terminal Functions

Main circuit and analog input terminal

Category	Symbol	Terminal name	Unit Type	Stack Type
Main circuit	L1/R,L2/S,L3/T	Power input	Connects a 3-phase power supply.	Not available in the stack type
	U,V,W	Inverter output	Connects a 3-phase motor.	Connects a 3-phase motor.As for the number of stacks per phase, 1 terminal is allotted per phase (stack).
	P (+),P1	For DC REACTOR connection	Connects a DC REACTOR. A DC REACTOR is optional for 55kW or lower, and must be always installed for 75kW or higher.	The "P1" terminal for connecting a DC reactor is not available with the stack type.
	P (+),N (-)	For BRAKING UNIT connection/For DC bus	Connects a braking resistor via the braking unit. Used for a DC bus connection system.	Used as a DC bus.
	P (+),DB	For EXTERNAL BRAKING RESISTOR connection	Connects an external braking resistor (optional).	The "DB" terminal for connecting an external braking resistor is not available with the stack type.
	⏚ G	For inverter	Ground terminal for inverter chassis.	
	R0,T0	Auxiliary control power supply	Connects the same AC power supply as that of the main circuit to back up the control circuit power supply.	
	R1,T1	Auxiliary input for fan power	Used as a power input for the AC cooling fan inside the inverter to combine with the high factor PWM converter with power regenerative function (on the models of 200V series 37kW or more, 400V series 75kW or more). Generally this is not necessary as long as the inverter is used individually.	Used as a power input to the AC cooling fan in the inverter. Be sure to supply power to the fan.
	DCF1 DCF2	DC fuse blow-out detection input	Not available in the unit type	Connects a microswitch to detect blow-out of the DC fuse and corresponds to the "b" contact output. DC24V 12 mA Typ
Speed setting	13	Potentiometer power supply	Used for power supply for a speed setting POT (variable resistor: 1 to 5kΩ). DC10V 10mA Max	
	12	Voltage input for speed setting	Used for analog reference voltage input. • Reversible operation can be selected by ±signals: 0 to +10V DC /0 to max. speed.	
	11	Analog input common	Common terminal to input signals.	
Analog input	Ai1	Analog input 1	The following functions can be selected and set according to the external analog input voltage. 0: Input signal off [OFF] 1: Auxiliary speed setting 1 [AUX-N1] 2: Auxiliary speed setting 2 [AUX-N2] 3: Torque limiter (level 1) [TL-REF1] 4: Torque limiter (level 2) [TL-REF2] 5: Torque bias reference [TB-REF] 6: Torque reference [T-REF] 7: Torque current reference [IT-REF] 8: Creep speed 1 in UP/DOWN setting [CRP-N1] 9: Creep speed 2 in UP/DOWN setting [CRP-N2] 10: Magnetic-flux reference [MF-REF] 11: Detected speed [LINE-N] 12: Motor temperature [M-TMP] 13: Speed override [N-OR] 14: Universal Ai [U-AI] 15: PID feedback value [PID-FB1] 16: PID reference value [PID-REF] 17: PID correction gain [PID-G] 18-24: Custom Ai1 to 7 [C-AI 1 to 7] 25: Speed main setting [N-REFV] 26: Current input speed setting [N-REFC]	
	Ai2	Analog input 2	Ai2 can be switched over between voltage input and current input by an internal switch. However, only a "Speed Setting" is available for the current input.	
	M	Analog input common	Common terminal to input signals.	

Digital input terminal

Item			Unit Type	Stack Type
Digital input (Switching is available between Sink and Source.)	FWD	Forward operation and stop command	[FWD-CM] ON: The motor runs in the forward direction. [FWD-CM] OFF: The motor decelerates and stops.	
	REV	Reverse operation and stop command	[REV - CM] ON: The motor runs in the reverse direction. [REV - CM] OFF: The motor decelerates and stops.	
	X1	Digital input 1	0, 1, 2, 3: Multistep speed selection (step 1 to 15) [0: SS1, 1: SS2, 2: SS4, 3: SS8] 4, 5: ASR, ACC/DEC time selection (4 steps) [4: RT1, 5: RT2] 6: Self maintenance selection [HLD] 7: Coast-to-stop command [BX] 8: Alarm reset [RST] 9: Trip command (External fault) [THR] 10: Jogging operation [JOG] 11: Speed setting N2/Speed setting N1 [N2/N1] 12: Motor M2 selection [M-CH2] 13: Motor M3 selection [M-CH3] 14: DC brake command [DCBRK] 15: ACC/DEC cleared to zero command [CLR] 16: Creep speed switching in UP/DOWN setting [CRP-N2/N1] 17: UP command in UP/DOWN setting [UP] 18: DOWN command in UP/DOWN setting [DOWN] 19: Write enable for KYEPAD (data can be changed) [WE-KP] 20: PID control cancel [KP/PID] 21: Inverse mode change over [IVS] 22: Interlock signal for 52-2 [IL] 23: Write enable through link [WE-LK] 24: Operation selection through link [LE] 25: Universal DI [U-DI] 26: Pick up start mode [STM] 27: Synchronization command [SYC] 28: Zero speed locking command [LOCK] 29: Pre-exciting command [EXITE] 30: Speed reference cancel [N-LIM] 31: H41 (torque reference) cancel [H41-CCL] 32: H42 (torque current reference) cancel [H42-CCL] 33: H43 (magnetic-flux reference) cancel [H43-CCL] 34: F40 (Torque control mode 1) cancel [F40-CCL] 35: Torque limit (Selection of level 1 or level 2) [TL2/TL1] 36: Bypass [BPS] 37,38: Torque bias command 1 / 2 [37: TB1, 38: TB2] 39: Droop selection [DROOP] 40: Zero hold [ZH-AI1] 41: Ai2 zero hold [ZH-AI2] 42: Ai3 zero hold [ZH-AI3] 43: Ai4 zero hold [ZH-AI4] 44: Ai1 polarity change [REV-AI1] 45: Ai2 polarity change [REV-AI2] 46: Ai3 polarity change [REV-AI3] 47: Ai4 polarity change [REV-AI4] 48: PID output inverse changeover [PID-INV] 49: PG alarm cancel [PG-CCL] 50: Undervoltage cancel [LU-CCL] 51: Ai torque bias hold [H-TB] 52: STOP1 (The motor stops with standard deceleration time) [SOPT1] 53: STOP2 (The motor decelerates and stops with deceleration time 4) [STOP2] 54: STOP3 (The motor stops with torque limiter) [STOP3] 55: DIA card enable [DIA] 56: DIB card enable [DIB] 57: Multi-winding motor control cancel [MT-CCL] 58-67: Custom Di 1 to 10 [C-DI 1 to 10] 68: Load adaptive parameter selection [AN-P2/1] 69: PID clear [PID-CCL] 70: PIDFF term e ective [PID-FF] 71: Speed limit calculation completion reset signal [NL-RST]74: Simulated external minor fault [FTB] 75:NTC thermistor alarm cancel [NTC-CCL] 76: Lifetime early warning cancel [LF-CCL] 78: PID Feedback change-over signal [PID-1/2] 79: PID torque bias selection [TB-PID]	
	X2	Digital input 2		
	X3	Digital input 3		
	X4	Digital input 4		
	X5	Digital input 5		
	X6	Digital input 6		
	X7	Digital input 7		
	X8	Digital input 8		
	X9	Digital input 9		

Item			Unit Type	Stack Type
	PLC	PLC signal power supply	Connects to PLC output signal power supply. It can also be used as a power supply for loads connected to the transistor outputs.	
	CM	Digital input common	Common terminal to digital input signals.	
Digital input (Safety function)	EN1,EN2	Safety function input terminal	When the circuit is open between EN1-PS or EN2-PS terminals, the switching elements of the inverter main circuit is turned off and the output is shut off (Certification pending).	
	PS			

Analog output and transistor output terminal

Item			Unit type	Stack type
Analog output	AO1	Analog output 1	Provides the monitor signal of 0 to ±10V DC for signals from the following: 0: Detected speed (Speedometer, unipolar) [N-FB1+] 1: Detected Speed (Speedometer, bipolar)[F-FB1±] 2: Speed setting 2 (Before acceleration/deceleration calculation) [N-REF2] 3: Speed setting 4 (ASR input) [N-REF4] 4: Detected speed [N-FB2±] 5: Detected line speed [LINE-N±] 6: Torque current reference (Torque ammeter, bipolar) [IT-REF±] 7: Torque current reference (Torque ammeter, unipolar) [IT-REF+] 8: Torque reference (Torque meter, bipolar) [T-REF±] 9: Torque reference (Torque meter, unipolar) [T-REF+] 10: Motor current rms value [V-AC] 11: Motor voltage rms value [V-AC] 12: Input power (motor output) [PWR] 13: DC link circuit voltage [V-DC] 14: +10V output test [P10] 15: -10V output test [N10]30: Universal AO [U-AO] 31-37: Custom AO1 to 7 [C-AO1 to 7] 38: Input power [PWR-IN] 39: Magnetic pole position signal [SMP]40: PID output value [PID-OUT]	
	AO2	Analog output 2		
	AO3	Analog output 3		
	M	Analog output common	Common terminal to input signals.	
Transistor output	Y1	Transistor output 1	Outputs the selected signals from the following items: 0: Inverter running [RUN] 1: Speed existence [N-EX] 2: Speed agreement [N-AG1] 3: Speed equivalence [N-AR] 4, 5, 6: Detected speed 1, 2, 3 [4: N-DT1, 5: N-DT2, 6: N-DT3] 7: Stopping on undervoltage [LU] 8: Detected torque polarity (braking/driving) [B/D] 9: Torque limiting [TL] 10, 11: Detected torque [10: T-DT1, 11: T-DT2] 12: KEYPAD operation mode [KP] 13: Inverter stopping [STOP] 14: Operation ready completion [RDY] 15: Magnetic-flux detection signal [MF-DT] 16: Motor M2 selection status [16: SW-M2] 17: Motor M3 selection status [16: SW-M3] 18: Brake release signal [BRK] 19: Alarm indication1 [AL1] 20: Alarm indication 2 [AL2] 21: Alarm indication 3 [AL4] 22: Alarm indication 4 [AL8] 23: Fan operation signal [FAN] 24: Auto-resetting [TRY] 25: Universal DO [U-DO] 26: Heat sink overheat early warning [INV-OH] 27: Synchronization completion signal [SY-C] 28: Lifetime alarm [LIFE] 29: Under accelerating [U-ACC] 30: Under decelerating [U-DEC] 31: Inverter overload early warning [INV-OL] 32: Motor temperature early warning [M-OH] 33: Motor overload early warning [M-OL] 34: DB overload early warning [DB-OL] 35: Link transmission error [LK-ERR] 36: Load adaptive control under limiting [ANL] 37: Load adaptive control under calculation [ANC] 38: Analog torque bias hold [TBH] 39-48: Custom DO 1 to 10 [C-DO 1 to 10]50: Z-phase detection signal [Z-RDY] 51: Multiple-winding selected status [MTS] 52: Multiple-winding cancel response [MEC-AB] 53: Master selected status [MSS] 54: Parallel system self station alarm [AL-SF] 55: Communications error stopping [LES] 56: Alarm relay [ALM] 57: Minor fault [L-ALM] 58: Maintenance early warning [MNT] 59: Braking transistor error [DBAL] 60: DC fan lock signal [DCFL] 61: Speed agreement 2 [N-AG2] 62: Speed agreement 3 [N-AG3] 63: Axial fan operation stop signal [MFAN] 66: Droop selection response [DSAB] 67: Torque command/torque current command cancel response [TCL-C] 68: Torque limit mode cancel response [F40-AB] 71: 73 loading command [PRT-73] 72: Y-terminal test output ON [Y-ON] 73: Y-terminal test output OFF[Y-OFF] 75: Clock battery life	
	Y2	Transistor output 2		
	Y3	Transistor output 3		
	Y4	Transistor output 4		
	CMY	Transistor output common	Common terminal to transistor output signals.	
Relay output	Y5A,Y5C	Relay output	Same functions as for Y1 to Y4 can be selected.	
	30A,30B,30C	Alarm relay output(for any fault)	Outputs a potential-free contact signal (1C) when a protective function is activated to stop the inverter. Can select alarm for active or non active conditions.	
Communications	DX+,DX-	RS-485 communicationsinput /output	Input/output terminals for RS-485 communications. Can connect up to 31 inverters through a multidrop (daisy chain) connection. Half-duplex method.	
	USB port	USB port	Front access, connector type: mini-B, USB 2.0 Full Speed	
Speed detection	PA,PB	Pulse generator 2-phase signal input	Terminals for connecting 2-phase signal of pulse generator.	
	PGP,PGM	Pulse generator power supply	+15V DC pulse generator power supply (can be switched to +12V).	
	FA,FB	Pulse generator output	Outputs pulse encoder signal with a frequency that can be divided by configurable ratio (set by function code). Open collector and complimentary (same voltage as PGP terminal) can be switched.	
	CM	Pulse generator output common	Common terminals to FA and FB.	
Temperature detection	TH1,THC	NTC Thermistor PTC Thermistor connection	Motor temperature can be detected with the NTC and the PTC thermistors. The motor overheat protective level can be specified by the PTC thermistor function.	

Protective Functions

Protective function details

Category	Item	Specifications	Displays	Relevant function codes
Protective Functions	Braking transistor abnormal (*)	Stops the inverter if it detects a braking transistor abnormality. (Only for models that incorporate a braking circuit.) Be sure to shut off the inverter primary power when this alarm is detected.	dbA	H103
	Braking resistor overheating (*)	Estimates the braking resistor temperature and stops the inverter if the allowable value is exceeded. Setting E35 to 37 is required depending on the used resistor.	dbH	E35 to E37
	DC fuse blown	This is displayed if the fuse for the main circuit DC blows because of a short-circuit in the IGBT circuit or other reason. This function is provided to prevent secondary accidents. Since inverter damage may have occurred, contact Fuji immediately. Unit type: Not less than 200V and 75kW, Not less than 400V, 90kW Stack type: Full capacity	dCF	
	Excessive position deviation	Activated if the positional deviation between the command and the detected values exceeds ten times function code o18 "Excessive deviation value" in synchronized operation.	dO	o18
	Encoder communications error	Activated if an encoder communications error is detected when using an ABS encoder of 17-bit high resolution (option card OPC-VG1-SPGT).	EC	
	Ground fault	Activated by a ground fault in the inverter output circuit. When ground-fault current is large, the overcurrent protective function may be activated. This function is provided to protect the inverter. Connect a separate earth-leakage protective relay or an earth-leakage circuit breaker if it is required to prevent accidents such as injury or fire.	EF	H103
	Memory error	Activated if a fault such as a "write error" occurs in the memory. (The number of times to write into the memory (nonvolatile memory) is limited (100,000 to 1,000,000 times). If data is written frequently and needlessly with the save all function, data changing and saving may be disabled, resulting in a memory error.)	Er 1	
	KEYPAD panel communication error	Activated if a communications error is detected between the inverter control circuit and the keypad when the start/stop command from the keypad is valid (function code F02=0). NOTE: A keypad communications error does not display or output an alarm when the inverter is operated by external signal input or the link function. The inverter continues operating.	Er2	F02
	CPU error	Activated if a CPU error occurs.	Er3	
	Network error	Activated if a communications error occurs due to noise when the inverter is operated through T- Link, SX bus or CC-Link.	Er4	o30,o31,H107 E01 to E14 E15 to E28
	RS-485 error	Activated if an RS-485 communications error occurs when function code H32 is set to 0 to 2 during inverter running via RS-485 communications and function code H38 is set between 0.1 and 60.0. This function is activated if the communications circuit is disconnected for longer than the time set in H38.	Er5	H32,H33,H36 H38,H107
	Operation procedure error	This function is activated if multiple option cards (T-Link, SX bus, CC-Link, etc.) are installed. Activated if both switches for selecting the usage mode are set the same setting, though multiple PG options can be installed. Activated if auto tuning for H01 is started with any of the digital inputs [BX], [STOP1], [STOP2], and [STP3] turned on. Activated if the FWD key on the keypad is not pressed for 20 seconds or more after selecting the operation of auto tuning for H01.	Er6	H01
	Output wiring error	Activated if the wires are not connected in the inverter output circuit during auto tuning.	Er7	H01
	A/D converter error	Activated if an error occurs in the A/D converter circuit.	Er8	
	Speed disagreement	Activated if the difference between the speed reference (speed setting) and the motor speed (detected speed, predicted speed) becomes excessive. The detection level and detection time can be set using function codes.	Er9	E43,E44,E45 H108
	Inverter communications error	Activated if a transmission error occurs during communications between inverters using the high-speed serial communications terminal block (option).	Erb	H107
	Simulated fault	A simulated alarm state can be generated by keypad operation or the PC loader.	Err	H108,H142
	Encoder error	Activated if an encoder error or failure is detected when using an ABS encoder of 17-bit high resolution (option card OPC-VG1-SPGT).	Et 1	
	Input open phase (*)	The inverter is protected against damage due to input open phase. An open phase may not be detected if the connected load is small or a DC reactor is connected.	L in	E45

*) Not available in the stack type

Category	Item	Specifications	Displays	Relevant function codes
Protective Functions	Stalled at start	Activated if the torque current reference value is equal or higher than the level set in function code H140, and the detected speed value or estimated speed value is equal or lower than the speed set in function code F37 "stop speed", for the period of time set in function code H141. The detection level and detection time can be set using function codes.	LOC	H108,H140,H141
	Undervoltage	Activated if the DC link circuit voltage decreases to the undervoltage level due to a reduction in the supply voltage.The alarm is not output when the DC link circuit voltage decreases and function code F14 is set to "3 to 5". • Undervoltage detection level: 200V series: 180V DC, 400V series: 360V DC.	LU	F14
	NTC thermistor disconnection	Activated if the thermistor circuit is disconnected when the use of NTC thermistors for motors M1, 2, 3 is configured with the corresponding function codes P30, A31 and A131. Also activated in extreme low temperatures (approx. -30°C or lower).	nrb	P30,A31,A131 H106
	Overcurrent	Cuts the output if motor current exceeds the inverter overcurrent specified value.	OC	
	Overheating of heat sink	Activated if the temperature of the heat sink that cools the rectifier diodes and the IGBTs increases due to cooling fan stoppage.	OH1	
	External alarm input	The inverter stops when the external alarm signal (THR) becomes active. This alarm is activated via control terminals (assigned to THR) which are connected to alarm terminals of external devices such as a braking unit or a braking resistor (in case these devices trip).	OH2	E01 to E14 F106
	Inverter internal overheat	Activated if the ambient temperature of the control PC board increases due to poor ventilation of the inverter.	OH3	
	Motor overheat	Activated if the detected temperature of the built-in NTC thermistor for motor temperature detection exceeds the data of function code E30 "Motor overheat protection."	OH4	E30,H106
	Motor 1 overload	Activated if the motor 1 current (inverter output current) exceeds the behavior level set by the function code F11.	OL1	F11,H106
	Motor 2 overload	Activated if the motor 2 current (inverter output current) exceeds the behavior level set by the function code F33.	OL2	A33,H106
	Motor 3 overload	Activated if the motor 3 current (inverter output current) exceeds the behavior level set by the function code F133.	OL3	A133,H106
	Inverter overload	Activated if the output current exceeds the overload characteristic of the inverse time characteristic. The inverter is stopped according to the temperatures of the inverter cooling unit and the switching element that is calculated from the output current.	OLU	F80
	Output phase loss detection	Stops the inverter if an open phase is detected in the output wiring during operation.	OPL	H103
	Overspeed	Activated if the motor speed (detected speed value or estimated speed value) exceeds 120% (can be changed by H90) of the setting of function code "maximum speed" (F03, A06, A106).	OS	H90
	Overvoltage	Activated if the DC link circuit voltage exceeds the overvoltage level due to an increase of supply voltage or regenerative braking current from the motor. However, the inverter cannot be protected from excessive voltage (high voltage, for example) supplied by mistake. • Overvoltage detection level 200V series: 405V DC, 400V series: 820V DC	OU	
	PG error	Activated if the PA, PB or power supply circuits of the encoder interface are disconnected. However, a PG error is not activated when sensor-less control or V/f control is selected.	PG	H104
	Charge circuit error (*)	Activated if the bypass circuit of the DC link circuit (magnetic contactor for the charging circuit bypass) is not closed after power is supplied (200V 37kW or more, 400V 75kW or more).	PbF	
	DC fan lock	Activated if the DC fan stops (200V 45kW or more, 400V 75kW or more).	dFA	H108
	Hardware error	Stops the inverter by detecting LSI errors on the PCB.	ErH	
	E-SX bus tact out-of-sinc error	Occurs if the E-SX tact cycle and inverter control cycle are out of synch.	ArE	H108
	Toggle error	Occurs if the PLC monitors the 2-bit signal of toggle signal 1 [TGL1] and toggle signal 2 [TGL2], and does not receive the specified change pattern after the time set in H144 elapses.	ArF	H107

*) Not available in the stack type

Protective Functions / External Dimensions

Category	Item	Specifications	Displays	Relevant function codes
Protective Functions	Minor fault (warning)	If an alarm or warning registered as a minor fault occurs, the minor fault indication [L-AL] is displayed on the keypad. For a minor fault, the minor fault output (Y terminal) is output. However, alarm relay output (30ABC) is not output and the inverter continues operating. Items to be set (Can be selected individually): Motor overheat (OH4), motor overload (OL 1-OL 3), NTC thermistor disconnection (nrb), external alarm (OH2), RS-485 communications (Er5), option communications error (Er4), inverter link error (ArF), simulated fault (Err), DC fan lock detection (dFA), speed disagreement (Er9), E-SX error (ArE), Stalled st Start (LOC), motor overheat early warning, motor overload early warning, battery life, lifetime alarm, fin overheat early warning, overheating at heat sink, inverter overload early warning The cause of each minor fault can be checked on the keypad.	L-AL	H106 to H108 H110 H111
	Surge protection	Protects the inverter from surge voltage coming from the power supply using the surge absorber that is connected to the main circuit power supply terminal (unit type only: L1/R, L2/S, L3/T) and the control power supply terminal (Ro, To) circuit.		
	Main power off detection (*)	Monitors the inverter AC input power to judge if the AC input power (main power) is established or not. If not, whether the inverter is to be operated or not can be selected. (When the power is supplied via a PWM converter or DC bus connection, do not change the setting of function code H76 as no AC input exists.)	----	H76

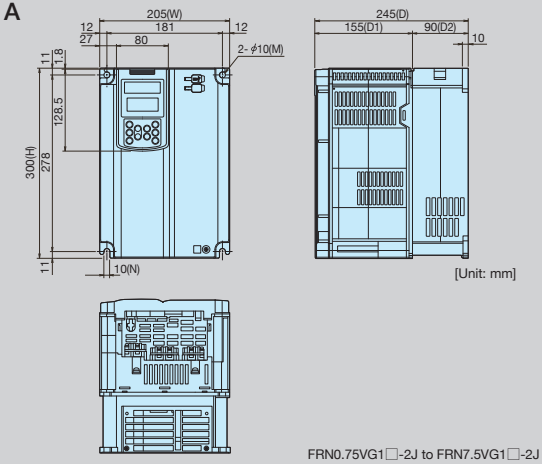
NOTES:
- All protective functions are reset automatically if the control power voltage decreases to where maintaining the operation of the inverter control circuit is impossible.
- The latest and last ten alarm codes and the latest and the last three alarm detailed data are stored.
- Stoppage due to a protective function can be reset from the RST key of the keypad or turning the circuit between the X terminal (assigned to RST) and the CM OFF and then ON. This action is invalid if the cause of an alarm is not found and resolved. If more than one alarm occurs at the same time, this action cannot be reset before resolving the causes of all alarms (the cause of an alarm that has not been cleared can be checked on the keypad).
- "30A/B/C" do not operate if interrupted by a minor fault.

*) Not available in the stack type

External Dimensions (Unit type)

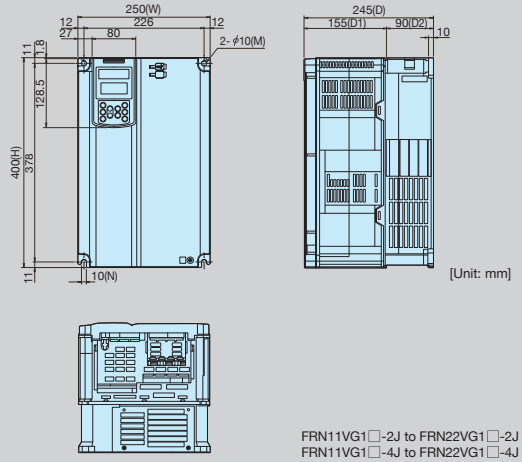
Inverter body

Fig. A



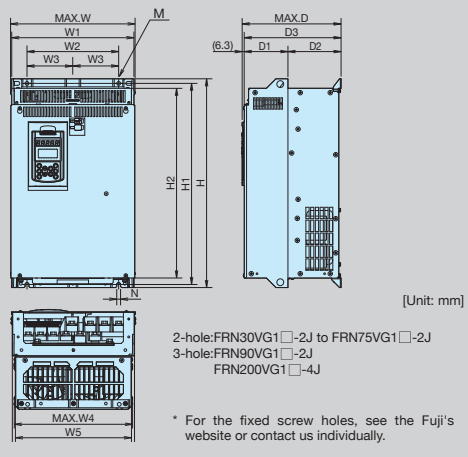
FRN0.75VG1□-2J to FRN7.5VG1□-2J

Fig. B



FRN11VG1□-2J to FRN22VG1□-2J
FRN11VG1□-4J to FRN22VG1□-4J

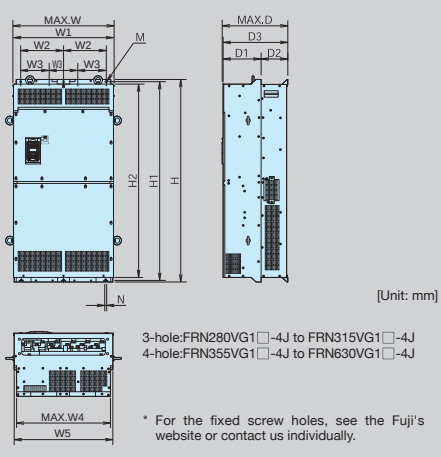
Fig. C



2-hole:FRN30VG1□-2J to FRN75VG1□-2J
3-hole:FRN90VG1□-2J
FRN200VG1□-4J

* For the fixed screw holes, see the Fuji's website or contact us individually.

Fig. D



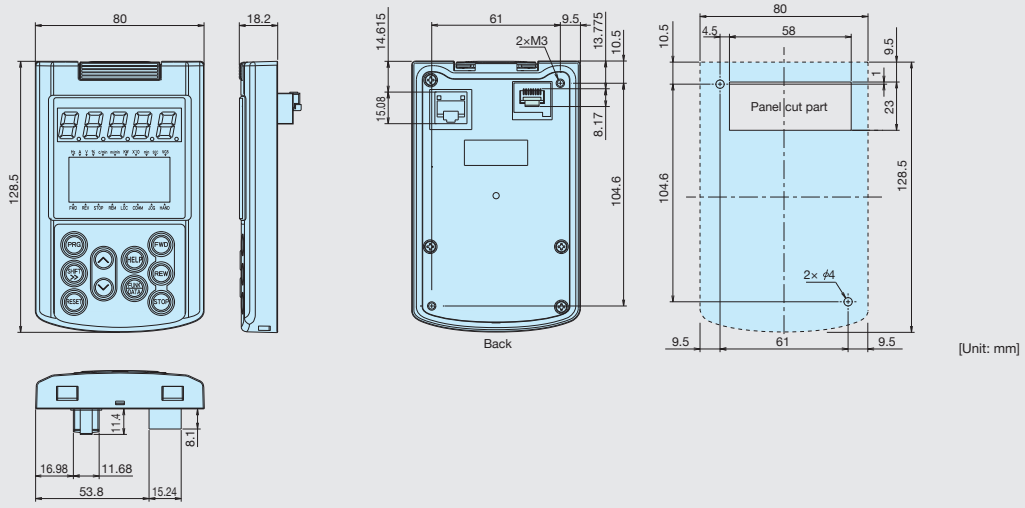
3-hole:FRN280VG1□-4J to FRN315VG1□-4J
4-hole:FRN355VG1□-4J to FRN630VG1□-4J

* For the fixed screw holes, see the Fuji's website or contact us individually.

For specific external diagrams, refer to Fuji Electric website. (http://www.fujielectric.co.jp/products/inverter/download/)

External Dimensions

KEYPAD



[Unit: mm]

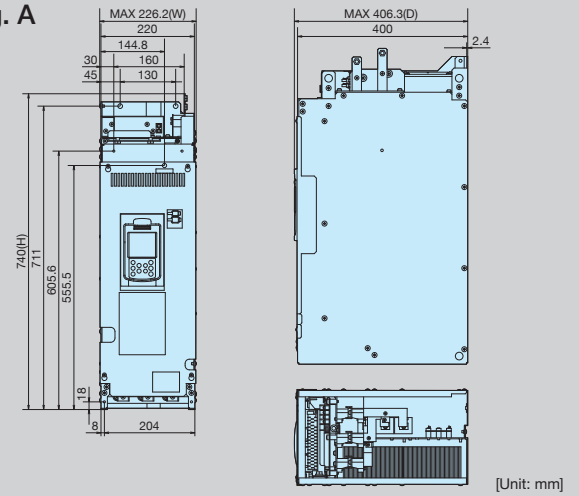
Series	Inverter type	Fig	Body external dimensions														
			W	W1	W2	W3	W4	W5	H	H1	H2	D	D1	D2	D3	M	N
3-phase 200V	FRN0.75VG1□-2J	A	205	-	-	-	-	-	300	-	-	245	155	90	-	2X ϕ10	10
	FRN1.5VG1□-2J	A															
	FRN2.2VG1□-2J	A															
	FRN3.7VG1□-2J	A															
	FRN5.5VG1□-2J	A															
	FRN7.5VG1□-2J	A															
	FRN11VG1□-2J	B	250						400								
	FRN15VG1□-2J	B															
	FRN18.5VG1□-2J	B															
	FRN22VG1□-2J	B															
	FRN30VG1□-2J	C	326.2	320	240		310.2	304	550	530	500	261.3	115	140	255		
	FRN37VG1□-2J	C	361.2	355	275		345.2	339	615	595	565	276.3		155	270		
	FRN45VG1□-2J	C							740	720	690						
	FRN55VG1□-2J	C															
	FRN75VG1□-2J	C	535.8	530	430		506.4	500.6	750		688.7	291.3	145	140	285	2X ϕ15	15
	FRN90VG1□-2J	C	686.4	680	-	290	656.4	650.6	880	850	819.5	366.3	180	180	360	3X ϕ15	
3-phase 400V	FRN3.7VG1□-4J	A	205	-	-	-	-	-	300	-	-	245	155	90	-	2X ϕ10	10
	FRN5.5VG1□-4J	A															
	FRN7.5VG1□-4J	A															
	FRN11VG1□-4J	B	250						400								
	FRN15VG1□-4J	B															
	FRN18.5VG1□-4J	B															
	FRN22VG1□-4J	B															
	FRN30VG1□-4J	C	326.2	320	240	-	310.2	304	550	530	500	261.3	115	140	255		
	FRN37VG1□-4J	C															
	FRN45VG1□-4J	C	361.2	355	275		345.2	339	615	595	565	276.3		155	270		
	FRN55VG1□-4J	C							675	655	625						
	FRN75VG1□-4J	C							740	720	690						
	FRN90VG1□-4J	C	536.4	530	430		506.4	500.6		710	678.7	321.3	135	180	315	2X ϕ15	15
	FRN110VG1□-4J	C															
	FRN132VG1□-4J	C							1000	970	939.5	366.3	180		360	3X ϕ15	
	FRN160VG1□-4J	C															
	FRN200VG1□-4J	C	686.4	680	-	290	656.4	650.6									
	FRN220VG1□-4J	C															
	FRN280VG1□-4J	D			290	-	659	653	1400	1370	1330	445.5	260		440		
	FRN315VG1□-4J	D															
	FRN355VG1□-4J	D	886.4	880	-	260	859.1	853				446.3				4X ϕ15	
	FRN400VG1□-4J	D															
	FRN500VG1□-4J	D	1006	1000		300	972	966	1550	1520	1480	505.9	313.2	186.8	500		
	FRN630VG1□-4J	D															

□:S:Standard type

External Dimensions

External Dimensions (Stack type)

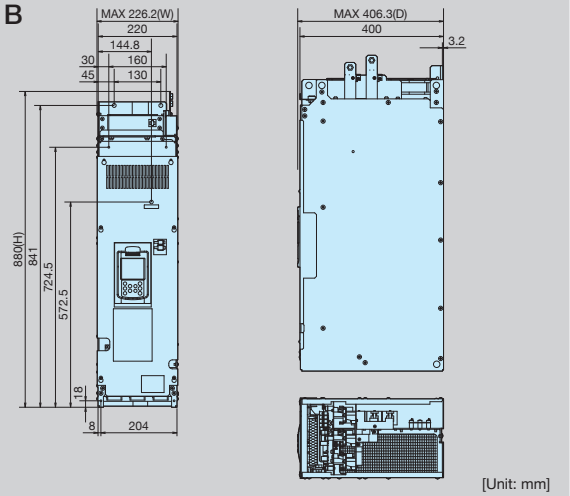
Fig. A



[Unit: mm]

FRN30SVG1S-4□ to FRN45SVG1S-4□

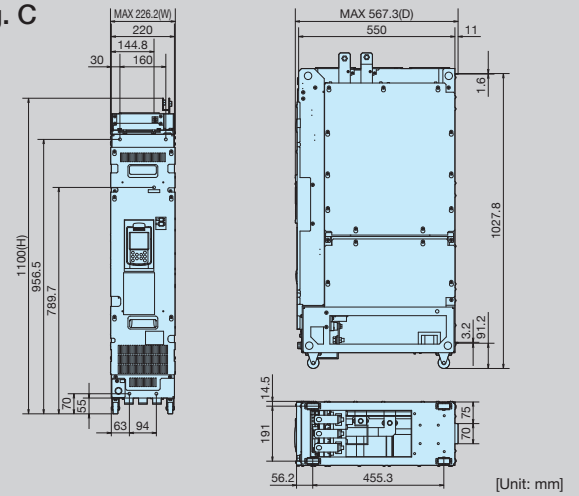
Fig. B



[Unit: mm]

FRN55SVG1S-4□ to FRN110SVG1S-4□

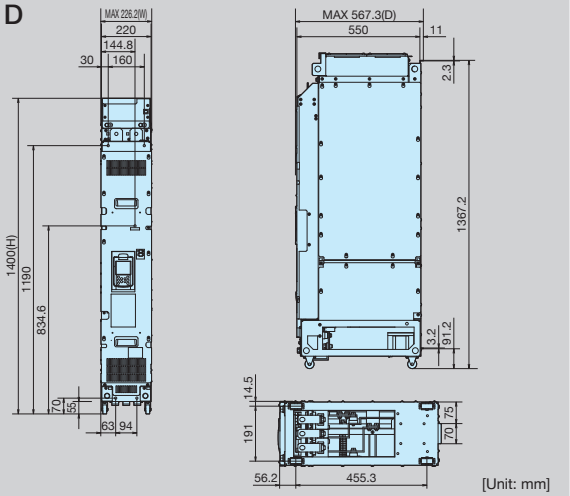
Fig. C



[Unit: mm]

FRN132SVG1S-4□ to FRN200SVG1S-4□

Fig. D



[Unit: mm]

FRN220SVG1S-4□ to FRN315SVG1S-4□

[Unit: mm]

Series	Inverter type	Fig	Body external dimensions		
			W	H	D
3-phase 400V	FRN30SVG1S-4□	A	226.2	740	406.3
	FRN37SVG1S-4□	A	226.2	740	406.3
	FRN45SVG1S-4□	A	226.2	740	406.3
	FRN55SVG1S-4□	B	226.2	880	406.3
	FRN75SVG1S-4□	B	226.2	880	406.3
	FRN90SVG1S-4□	B	226.2	880	406.3
	FRN110SVG1S-4□	B	226.2	880	406.3
	FRN132SVG1S-4□	C	226.2	1100	567.3
	FRN160SVG1S-4□	C	226.2	1100	567.3
	FRN200SVG1S-4□	C	226.2	1100	567.3
	FRN220SVG1S-4□	D	226.2	1400	567.3
	FRN250SVG1S-4□	D	226.2	1400	567.3
	FRN280SVG1S-4□	D	226.2	1400	567.3
	FRN315SVG1S-4□	D	226.2	1400	567.3
	FRN630BVG1S-4□(*1)	-	-	-	-
	FRN710BVG1S-4□(*1)	-	-	-	-
	FRN800BVG1S-4□(*1)	-	-	-	-

*1) One set of the inverter consists of three stacks. The touch panel is connected to the V phase only.
For the external dimensions information, contact the Fuji Electric Sales Department.

Names and Functions of the Keypad

Names and Functions of the Keypad

Up/Down keys
Operation mode:
Increases or decreases the speed.
Program mode:
Changes the function codes and specified data values.

Program key
Switches the display to the menu screen or the initial screens for operation and alarm modes.

Shift key (column shift)
Used to move the cursor horizontally in order to change data, and to jump to other function blocks (when pressed together with the UP/DOWN keys).

Reset key
Program mode:
Cancels the current input data and changes the screen.
Trip mode:
Releases a trip.

Function/Data select key
Used to switch the displayed value on the LED monitor, input the speed setting and store function code data.

Unit indication
Displays the units for the information that appears on the LED monitor.

Stop key
Stops motor operation.

LED monitor
Operation mode:
Displays the setting frequency, output current, output voltage, motor speed, and line speed.
Trip mode:
Displays the cause of a trip.

LCD monitor
Displays different information ranging from operation status to function data.
A real-time clock is installed as a standard feature. NEW
Operation guidance is scrolled along the bottom.

Operation key
Starts motor operation.

RUN LED
Lit during operation by the FWD/REV signal or by operation commands via communications.

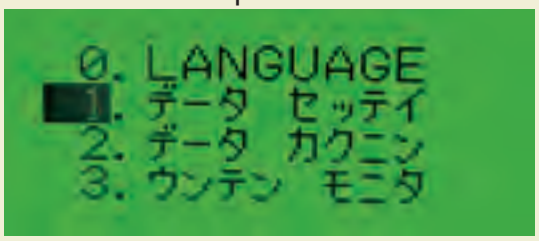
HELP key NEW
Displays guidance screens including the key operation guidance for each LCD monitor display.

Features

- High visibility LCD with backlight
- 5-digit display with large 7-segment LED
- Data of up to three inverters can be copied.
- Supported languages: Japanese, English, Chinese, Korean (Hangul characters), (German, French, Spanish, Italian)*1
  *1 Available soon

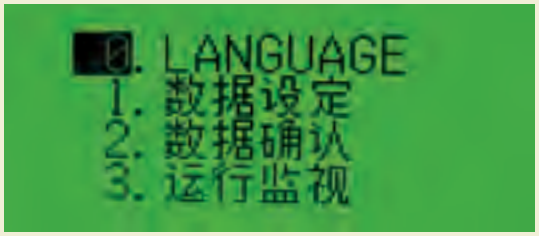
<Display sample>

Japanese

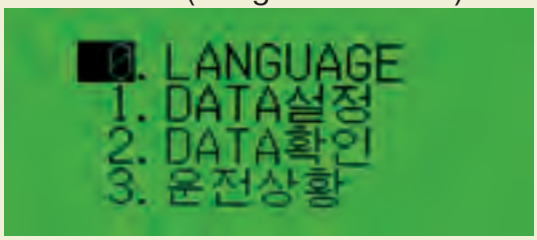


English

Chinese



Korean (Hangul characters)



Dedicated motor specifications (Synchronous motor with sensor)

3-phase 200V series standard specifications

Item		Specifications															
Dedicated motor rated output [kW]		0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90
Applicable motor type (MVK_)		8095A	8097A	8107A	8115A	8133A	8135A	8165A	8167A	8184A	8185A	8187A	8207A	8208A	9224A	9254A	9256A
Moment of inertia of rotor J [kg•m²]		0.009	0.009	0.009	0.016	0.030	0.037	0.085	0.11	0.21	0.23	0.34	0.41	0.47	0.53	0.88	1.03
Rotor GD [kgf•m²]		0.036	0.036	0.036	0.065	0.12	0.15	0.34	0.47	0.83	0.92	1.34	1.65	1.87	2.12	3.52	4.12
Base speed/Max. speed [r/min]		1500/3600										1500/3000			1500/2400		1500/2000
Vibration		V10 or less													V15 or less		
Cooling fan*	Voltage [V], Frequency [Hz]	-	200 to 210V/50Hz,200 to 230/60Hz												200V/50Hz, 200,220V/60Hz		
	Number of phases/poles	-	Single phase, 4P					3-phase, 4P									
	Input power [W]	-	40/50					90/120		150/210					80/120	270/390	
	Current [A]	-	0.29/0.27 to 0.31					0.49/ 0.44 to 0.48		0.75/0.77 to 0.8					0.76/ 0.8.0.8	1.9/2.0,2.0	
Approx.weight [kg]		28	29	32	46	63	73	111	133	190	197	235	280	296	380	510	570

* Only the MVK8095A (0.75 kW) is a self-cooled type.

3-phase 400V series standard specifications

Item		Specifications																	
Dedicated motor rated output [kW]		3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	132	160	200	220
Applicable motor type (MVK_)		8115A	8133A	8135A	8165A	8167A	8184A	8185A	8187A	8207A	8208A	9224A	9254A	9256A	9284A	9286A	528KA	528LA	531FA
Moment of inertia of rotor J [kg•m²]		0.016	0.030	0.037	0.085	0.11	0.21	0.23	0.34	0.41	0.47	0.53	0.88	1.03	1.54	1.77	1.72	1.83	2.33
Rotor GD [kgf•m²]		0.065	0.12	0.15	0.34	0.47	0.83	0.92	1.34	1.65	1.87	2.12	3.52	4.12	6.16	7.08	6.88	7.32	9.32
Base speed/Max. speed [r/min]		1500/3600							1500/3000			1500/2400		1500/2000					
Vibration		V10 or less										V15 or less							
Cooling fan	Voltage [V], Frequency [Hz]	200 to 210V/50Hz, 200 to 230V/60Hz			400 to 420V/50Hz,400 to 440V/60Hz							400V/50Hz,400,440V/60Hz							
	Number of phases/poles	Single phase, 4P			3-phase, 4P														
	Input power [W]	40/50			90/120		150/210					80/ 120	270/390				2200		3700
	Current [A]	0.29/0.27 to 0.31			0.27/ 0.24 to 0.25		0.38/0.39 to 0.4					0.39/ 0.4,0.4	1.0/1.0,1.0				4.6/4.3,4.1		7.8/ 7.1,7.6
Approx.weight [kg]		46	63	73	111	133	190	197	235	280	296	380	510	570	710	760	1270	1310	1630

3-phase 400V series standard specifications

Item		Specifications					
Dedicated motor rated output [kW]		250	280	300	315	355	400
Applicable motor type (MVK_)		531GA	531HA	535GA	535GA	535HA	535JA
Moment of inertia of rotor J [kg•m²]		2.52	2.76	5.99	5.99	6.53	7.18
Rotor GD [kgf•m²]		10.08	11.04	23.96	23.96	26.12	28.72
Base speed/Max. speed [r/min]		1500/2000					
Vibration		V15 or less					
Cooling fan	Voltage [V], Frequency [Hz]	400V/50Hz,400,440V/60Hz					
	Number of phases/poles	3-phase, 4P					
	Input power [W]	3700					
	Current [A]	7.8/7.1,7.6					
Approx.weight [kg]		1685	1745	2230	2230	2310	2420

Common Specifications

Item	Specifications
Insulation class/Number of poles	Class F/4P
Terminal design	Main terminal box (lug type): 3 or 6 main circuit terminals, NTC thermister terminals = 2 pcs (MVK 8 series), 3 pcs (MVK 9 series, MVK 5 series, 1PC is a spare). Auxiliary terminal box (terminal block): Pulse encoder (P6P, P6M,PA, PB, SS), Cooling fan (FU, FV, FW)
Mounting method	Legs mounted (IMB3) NOTE: Contact FUJI for other methods.
Degree of protection, Cooling method	IP44, Totally enclosed forced-ventilation system with cooling fan motor. A cooling fan blows air over the motor toward the drive-end. * Only the MVK8095A (0.75 kW) is a self-cooled type.
Installation location	Indoor, altitude 1000m or less.
Ambient temperature, humidity	-10 to +40°C, 90%RH or less (no condensation)
Color	Munsell N5
Standard conformity	MVK8 series: JEM1466 or JEC-2137-2000, MVK9 and MVK5 series: JEC-2137-2000
Standard built-in part	Pulse encoder (1024P/R, DC+5V, A ,B ,Z, U, V, W line driver output), NTC thermistor 1 pc (2 pcs for 110kW or more), cooling fan

Note 1) For motors applicable with 55 kW or more, the torque is accurate to ±5%.If you need more accuracy, contact Fuji.
Note 2) If you need a motor other than the dedicated motor with 4 poles and base speed of 1500 r/min, contact Fuji Electric.

External dimensions of dedicated motors (Induction motor with sensor)

MVK

Fig. A

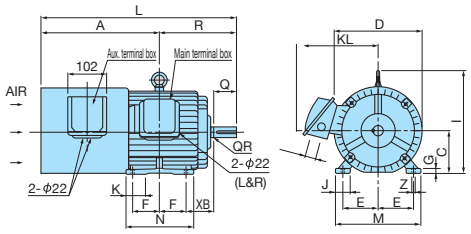
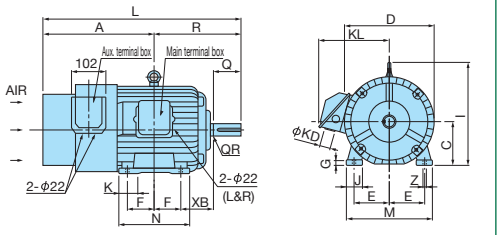


Fig. B



Shaft extension

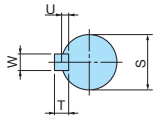


Fig. C

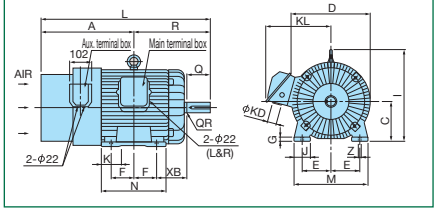


Fig. D

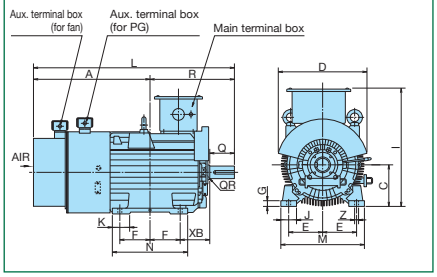
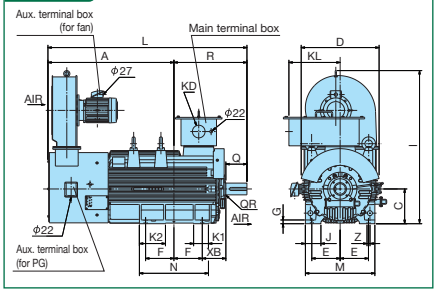


Fig. E



[Unit: mm]

Motor rated output [kW]	Type	Fig	Dimensions																			Shaft extension						Approx. weight [kg]
			A	C	D	E	F	G	I	J	K	K1	K2	KD	KL	L	M	N	R	XB	Z	Q	QR	S	T	U	W	
0.75	MVK8095A	A	201.5	90	204	70	62.5	10	195	35.5	35.5	-	-	27	189	370	170	150	168.5	56	10	50	0.5	24j6	7	4	8	28
1.5	MVK8097A		277.5		203											446												29
2.2	MVK8107A		292	100		80	70	12.5	238	40	40				190	485	195	170	193	63	12	60		28j6				32
3.7	MVK8115A		299	112	236	95		14	270		50				205	499	224	175	200	70								46
5.5	MVK8113A	B	309	132	273	108		17	311	45				34	223	548	250	180	239	89		80		38k6	8	5	10	63
7.5	MVK8135A		328				89									586		212	258									73
11	MVK8165A	A	400	160	321	127	105	18	376	50	63			48	272	723	300	250	323	108	14.5	110	1	42k6			12	111
15	MVK8167A		422				127									767		300	345									133
18.5	MVK8184A		435	180	376	139.5	120.5	20	428	75	75				305	786.5	350	292	351.5	121			1.5	48k6	9	5.5	14	190
22	MVK8185A																											197
30	MVK8187A		454				139.5							60		824.5		330	370.5					55m6	10	6	16	235
37	MVK8207A	C	490	200	411	159	152.5	25	466	80	85			80	364	915.5	390	360	425.5	133	18.5	140	2	60m6	11	7	18	280
45	MVK8208A																											296
55	MVK9224A		723	225	445	178	143		515		95				391	1155	436	366	432	149				65m6				380
75	MVK9254A	D	693.5	250	545	203	155.5	30	743	100	120				106	1157	506	411	463.5	168	24			75m6	12	7.5	20	510
90	MVK9256A		711.5				174.5									1194		449	483.5									570
110	MVK9284A		764	280	605	228.5	184	35	798						203	1308	557	468	544	190		170		85m6	14	9	22	710
132	MVK9286A		789.5				209.5									1359		519	569.5									760
160	MVK528JA	E	1015.5		628		228.5	30	1234	125	-	120	210	102	413	1604	560	557	588.5				1					1230
200	MVK528LA															1350												
220	MVK531FA		1073	315	689	254	254	36	1425	150		140	240			1713	630	648	640	216	28		2	95m6			25	1690
250	MVK531GA																											1750
280	MVK531HA																											1820
300	MVK535GA		1111	355	778	305	355		1510	160		180	330			1956	730	890	845	280		210		100m6	16	10	28	2230
315																												
355	MVK535HA																											2310
400	MVK535JA																											2420

Note 1) MVK8095A (0.75kW) is a natural cooling type motor (cooling system: IC410). Note 2) MVK8095A (0.75kW) has the cable lead-in hole of Φ22 (in 1 place).
Note 3) MVK9224A (55kW) has an aux. terminal box (for fan) as a supplement for Fig. C.
Note 4) Allowable tolerance of dimension: Height of rotary shaft C ≦ 250 mm ……$^{0}_{-0.5}$mm, C > 250mm ……$^{0}_{-1.0}$ mm

Dedicated motor Specifications (Synchronous motor with sensor)

3-phase 200V series standard specification

Item		Specifications											
Dedicated motor rated output [kW]		5.5	7.5	11	15	18.5	22	30	37	45	55	75	90
Dedicated motor type (GNF_)		2114A	2115A	2117A	2118A	2136A	2137A	2139A	2165A	2167A	2185A	2187A	2207A
Moment of inertia of rotor [kg·m²]		0.018	0.021	0.027	0.036	0.065	0.070	0.090	0.153	0.191	0.350	0.467	0.805
Rotor GD² [kgf·m²]		0.072	0.084	0.107	0.143	0.259	0.281	0.360	0.610	0.763	1.401	1.868	3.220
Base speed/Max. speed [r/min]		1500/2000											
Rated current [A]		20/20	29/29	42/42	57/57	71/70	82/81	113/108	144/144	165/165	200/200	270/270	316/316
Vibration		V10 or less											
Cooling fan	Voltage [V], frequency [Hz]	200 to 240,50/60							200 to 210/50,200 to 230/60				
	Number of phases/poles	3-phase, 2P							3-phase, 4P				
	Input power [W]	38 to 44/56 to 58				54 to 58/70 to 78			90/120		150/210		
	Current [A]	0.13 to 0.16/0.18 to 0.16				0.18 to 0.18/0.22 to 0.21			0.49/0.44 to 0.48		0.75/0.77 to 0.8		
Approx.weight [kg]		51	55	69	78	100	106	127	170	192	247	325	420

3-phase 400V series standard specification

Item		Specifications											
Dedicated motor rated output [kW]		5.5	7.5	11	15	18.5	22	30	37	45	55	75	90
Dedicated motor type (GNF_)		2114A	2115A	2117A	2118A	2136A	2137A	2139A	2165A	2167A	2185A	2187A	2207A
Moment of inertia of rotor [kg·m²]		0.018	0.021	0.027	0.036	0.065	0.070	0.090	0.153	0.191	0.350	0.467	0.805
Rotor GD² [kgf·m²]		0.072	0.084	0.107	0.143	0.259	0.281	0.360	0.610	0.763	1.401	1.868	3.220
Base speed/Max. speed [r/min]		1500/2000											
Rated current [A]		10/10	15/15	21/21	29/29	36/35	41/41	57/54	72/72	83/83	100/100	135/135	158/158
Vibration		V10 or less											
Cooling fan	Voltage [V], frequency [Hz]	200 to 240,50/60							400 to 420/50,400 to 440/60				
	Number of phases/poles	3-phase, 2P							3-phase, 4P				
	Input power [W]	38 to 44/56 to 58				54 to 58/70 to 78			90/120		150/210		
	Current [A]	0.13 to 0.16/0.18 to 0.16				0.18 to 0.18/0.22 to 0.21			0.27/0.24 to 0.25		0.38/0.39 to 0.4		
Approx.weight [kg]		51	55	69	78	100	106	127	170	192	247	325	420

3-phase 400V series standard specification

Item		Specifications							
Dedicated motor rated output [kW]		110	132	160	200	220	250	280	300
Dedicated motor type (GNF_)		2224B	2226B	2254B	2256B	2284B	2284B	2286B	2286B
Moment of inertia of rotor [kg·m²]		0.882	0.994	1.96	2.22	2.89		3.24	
Rotor GD² [kgf·m²]		3.53	3.98	7.84	8.88	11.6		13.0	
Base speed/Max. speed [r/min]		1500/2000							
Rated current [A]		198	232	273	340	369	420	480	520
Vibration		V10 or less							
Cooling fan	Voltage [V]	380,400,415/400,415,440,460							
	Number of phases/poles	3-phase, 4P							
	Power frequency	50/60							
	Input power [W]	80/120		270/390					
	Current [A]	0.36,0.38,0.41/0.4,0.4,0.4,0.4		0.95,0.95,1/1,1,1,1					
Approx.weight [kg]		520	580	760	810	1020		1080	

Common Specifications

Item	Specifications
Insulation class/Number of poles	Class F/6P
Terminal design	Main terminal box (lug type): 3 or 6 main circuit terminals NTC thermister terminals = 2 pcs(1 pc is a spare), 110kW or more Auxiliary terminal box (terminal block): cooling fan (FU, FV, FW)
	Pulse encoder (connector type), cooling fan (FU, FV, FW)
Rotation direction	CCW direction when viewed from operator
Mounting method	Legs mounted (IMB3) (NOTE): Contact FUJI for other methods.
Overload resistance	150% 1min (*1)
Time rating	S1
Degree of protection, Cooling method	IP44, Totally enclosed forced-ventilation system with cooling fan motor. A cooling fan blows air over the motor toward the drive-end.
Installation location	Indoor, altitude 1000m or less.
Ambient temperature and humidity	-10 to +40°C, 90% RH or less (no condensation)
Noise	5.5kW to 90kW:80 dB(A) or less at 1m,110kW to 300kW:90 dB (A) or less at 1m
Vibration resistance	6.86m/s² (0.7G)
Painting color	Munsell N1.2
Standard conformity	JEM 1487: 2005
Standard built-in part	Pulse encoder (1024 P/R, DC + 5 V, A ,B ,Z, U, V, W line driver output), NTC thermistor 1 pc (2 pcs for 110 kW or more), cooling fan

*1) When using the HD Specification, 150% for 1 min due to motor restriction.

External dimensions of dedicated motors (Synchronous motor with sensor)

GNF2

Shaft extension

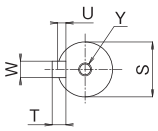


Fig. A

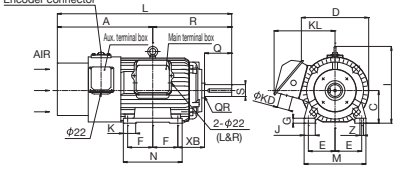


Fig. B

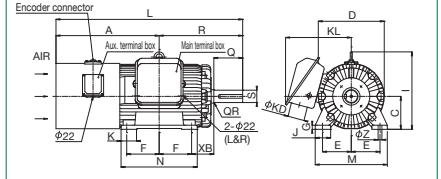


Fig. C

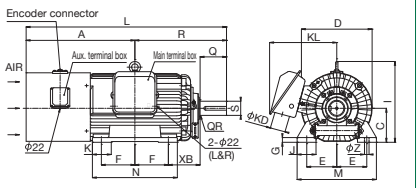


Fig. D

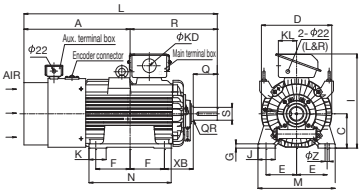


Fig. E

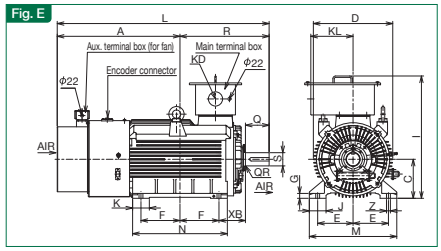
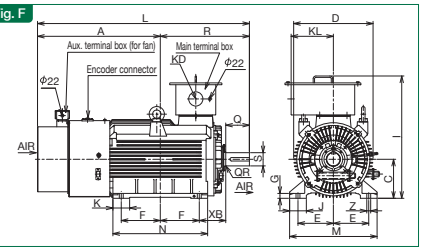


Fig. F



[Unit: mm]

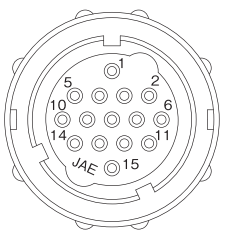
Motor rated output [kW]	Type	Frame no.	Fig	Dimensions																	Shaft extension							Approx. weight [kg]
				A	C	D	E	F	G	I	J	K	KD	KL	L	M	N	R	XB	Z	Q	QR	S	T	U	W	Y	
5.5	GNF2114A	112Mh	A	335.5	112	235	95	70	14	270	40	50	34	200	555.5	224	175	220	70	12	80	0.5	38k6	8	5	10	M10X20	51
7.5	GNF2115A			335.5	112	235	95	70	14	270	40	50	34	200	555.5	224	175	220	70	12	80	0.5	38k6	8	5	10	M10X20	55
11	GNF2117A	112Jh		380.5	112	235	95	100	18	270	55	50	48	235	698.5	228	238	318	108	14.5	110	1	42k6	8	5	12	M10X20	69
15	GNF2118A			380.5	112	235	95	100	18	270	55	50	48	235	698.5	228	238	318	108	14.5	110	1	42k6	8	5	12	M10X20	78
18.5	GNF2136A	132Lh		386	132	272	108	101.5	20	311	45	50	48	247	705.5	250	238	319.5	108	14.5	110	1.5	48k6	9	5.5	14	M10X20	100
22	GNF2137A			386	132	272	108	101.5	20	311	45	50	48	247	705.5	250	238	319.5	108	14.5	110	1.5	48k6	9	5.5	14	M10X20	106
30	GNF2139A	132Hh		424.5	132	272	108	140	20	311	45	50	60	247	782.5	250	313	358	108	14.5	110	1.5	55m6	10	6	16	M10X20	127
37	GNF2165A	160Lg	B	470.5	160	319	139.5	127	20	376	75	75	80	320	845.5	350	300	375	108	18.5	140	2	60m6	11	7	18	M12X25	170
45	GNF2167A	160Jg		501	160	319	139.5	157.5	20	376	75	75	80	320	906.5	350	370	405.5	108	18.5	140	2	60m6	11	7	18	M12X25	192
55	GNF2185A	180Lg		510	180	375	159	139.5	25	428	80	85	80	356	910.5	390	330	400.5	121	18.5	140	2	65m6	11	7	18	M12X25	247
75	GNF2187A	180Jg	C	576	180	375	159	177.5	25	428	100	100	80	356	1061.5	420	450	485.5	168	24	140	2	75m6	12	7.5	20	M12X25	325
90	GNF2207A	200Jg	D	618.5	200	410	178	200	25	549	100	100	80	107	1126.5	450	479	508	168	24	140	2	75m6	12	7.5	20	M12X25	420
110	GNF2224B	225Kg		711	225	446	203	200	28	628	100	120	80	142	1249	506	526	538	168	24	170	1	85m6	14	9	22	M20×35	520
132	GNF2226B	225Hg		761	225	446	203	250	28	628	100	120	80	142	1349	506	626	588	168	24	170	1	85m6	14	9	22	M20×35	580
160	GNF2254B	250Hg	E	829	250	508	228.5	280	32	763	100	120	80	203	1469	557	677	640	190	24	170	1	95m6	14	9	25	M20×35	760
200	GNF2256B			829	250	505	228.5	280	32	763	100	120	80	203	1469	557	677	640	190	24	170	1	95m6	14	9	25	M20×35	810
220	GNF2284B	280Jf	F	881	280	570	254	280	35	878	120	120	102	303	1521	628	680	640	190	28	170	1	95m6	14	9	25	M20×35	1020
250	GNF2284B			881	280	570	254	280	35	878	120	120	102	303	1521	628	680	640	190	28	170	1	95m6	14	9	25	M20×35	1020
280	GNF2286B			881	280	570	254	280	35	878	120	120	102	303	1521	628	680	640	190	28	170	1	95m6	14	9	25	M20×35	1080
300	GNF2286B			881	280	570	254	280	35	878	120	120	102	303	1521	628	680	640	190	28	170	1	95m6	14	9	25	M20×35	1080

Note 1) The models of 110kW or higher are designed to be coupled directly to the load. Contact Fuji in case of coupled to belt.
Note 2) Allowable tolerance of dimension: Height of rotary shaft C≦250mm····· $^{0}_{-0.5}$mm, C > 250mm····· $^{0}_{-1.0}$mm

Connector specifications for encoder connection [Manufacturer: Japan Aviation Electronics]

Motor Type	Receptacle installed to motor	Items prepared by customer	
		Straight plug	Angle plug
	Type	Type	Type
GNF2 type	JN2AW15PL1 (15P receptacle)	JN2DW15SL1 (15P straight plug)	JN2FW15SL1 (15P angle plug)
	Terminal of receptacle installed to motor	Recommended terminal (solder connection)	
	Type	Terminal type (Note 2)	Max applicable cable size
	JN1-22-26P (Crimp type pin)	JN1-22-22F-PKG100	AWG20 (Jacketed OD: Φ1.5mm or less)

Terminal arrangement diagram



Connector NO.	Symbols on plate	Encoder signal
1	+5V	DC+5V
2	0V	0V
3	A	A
4	$\overline{A}$	Anot
5	B	B
6	$\overline{B}$	Bnot
7	Z	Z
8	$\overline{Z}$	Znot
9	U	U
10	$\overline{U}$	Unot
11	V	V
12	$\overline{V}$	Vnot
13	W	W
14	$\overline{W}$	Wnot
15	–	–

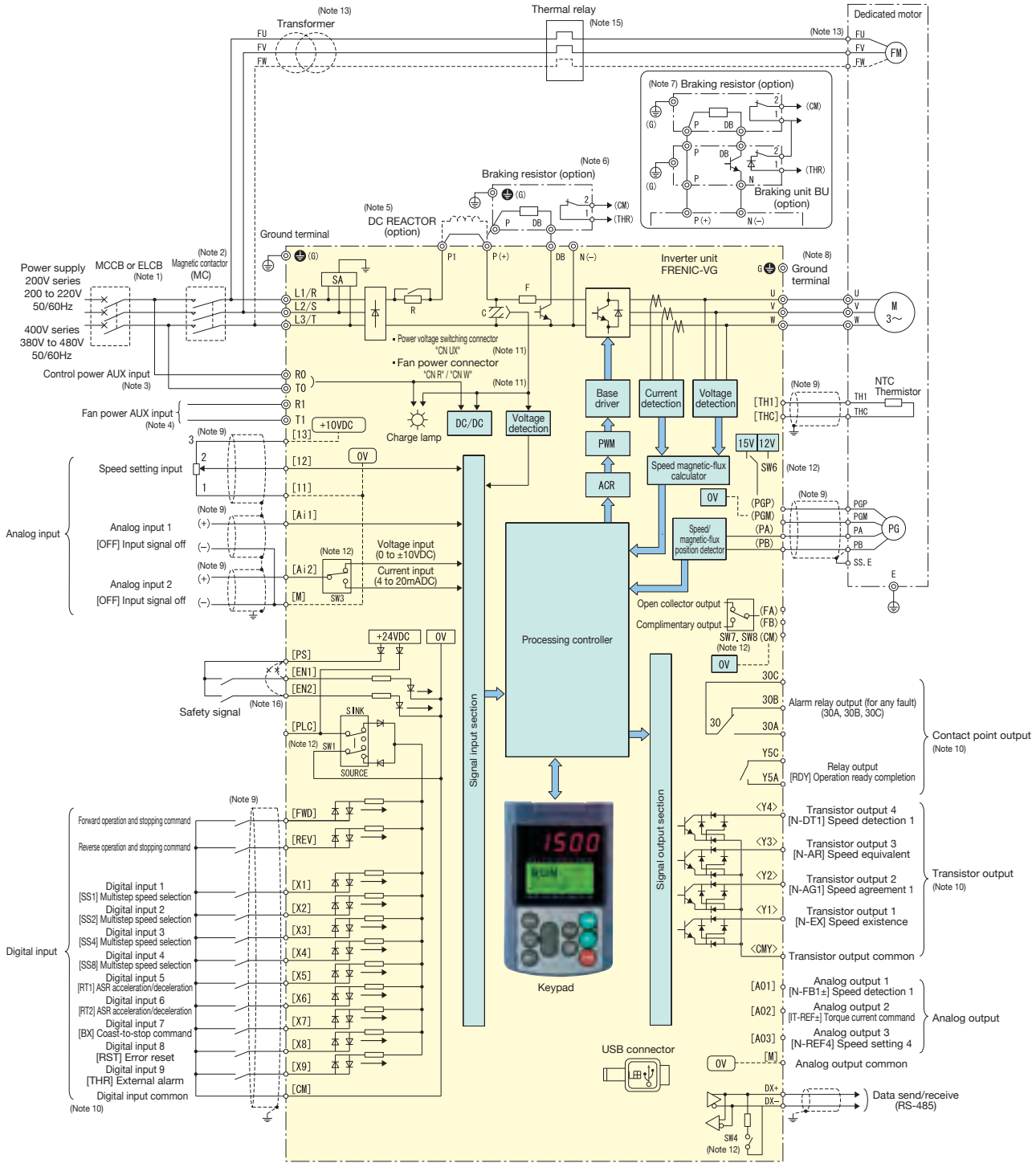
Note1) The Following PG shield cable is recommended.

Kind	Braided shielded cable (twisted pair cable, cable OD: approx. 10)
No. of cores	14 cores or more
Diameter	0.2mm² to 0.3mm²
Jacketed OD	Φ1.5 or less

Note2) The PKG of contact terminal type is in bulk by 100 pieces.
Note3) Connect the contact terminal by soldering.
Note4) Contact Fuji if preparing the item mentioned above is difficult.
They are available as options. (Specify the plug type and cable length.)

Wiring Diagram

Basic Wiring Diagram



(Note1) Install a recommended molded-case circuit-breaker (MCCB) or an earth-leakage circuit-breaker (ELCB) (with an overcurrent protection function) in the primary circuit of the inverter to protect wiring. At this time, ensure that the circuit breaker capacity is equivalent to or lower than the recommended capacity.

(Note2) Install a magnetic contactor (MC) for each inverter to separate the inverter from the power supply, apart from the MCCB or ELCB, when necessary. Connect a surge absorber in parallel when installing a coil such as the MC or solenoid near the inverter.

(Note3) Connect this terminal to the power supply to retain relay alarm signals when the protection function is activated, or to keep the Keypad on even when the inverter main power supply is cut. The inverter can be operated without inputting the power to this terminal.

(Note4) Normally this is not necessary to connect. Used when combining the unit such as high power factor PWM converter with power regenerative function. (RHC series)

(Note5) When connecting a DC reactor (DCR option), remove the jumper bar from across the inverter main circuit terminals [P1] and [P(+)]. The DCR must be connected to the units of 55kW (in case of LD) and 75kW or larger capacities. Use the DC reactor (option) under the following conditions: the capacity of the power transformer is 500kVA or more; or is ten times or more than the inverter rated capacity; or a load from a thyristor exists on the same power supply system.

(Note6) A braking transistor is built in the inverters with 55kW or less (200V series) and160kW or less (400V series). It can be directly connected across P(+)-DB.

(Note7) When connecting a braking resistor to the inverter with the capacity 75kW or more (200V series) and 200kW or more (400V series), be sure to use a braking unit (option). Connect the braking unit (option) across P (+) and N (-). The auxiliary terminals [1] and [2] have polarity. Connect them according to the diagram above.

(Note8) This is a terminal for grounding the motor. To suppress inverter noise, it is recommended to use this terminal for motor grounding.

(Note9) Use twisted or shielded cables for the control signals. The shield conductor normally should be grounded, however, if noise is significantly induced from external devices, it may be suppressed by connecting it to 0V ([M], [11], [THC]) and 0V ([CM]). Set apart from the main circuit wiring as far as possible, and avoid installing in the same duct. (It is recommended to separate more than 10cm.) If crossed, arrange so that it becomes almost perpendicular to the main circuit wiring.

(Note10) The functions indicated on terminals [X1] to [X9] (digital input), terminals [Y1] to [Y4] (transistor output), and terminals [Y5A/C] (contact output) are those allocated in the factory.

(Note11) This is a switching connector of the main circuit (fan power).

(Note12) This is a switch on the control PCB.

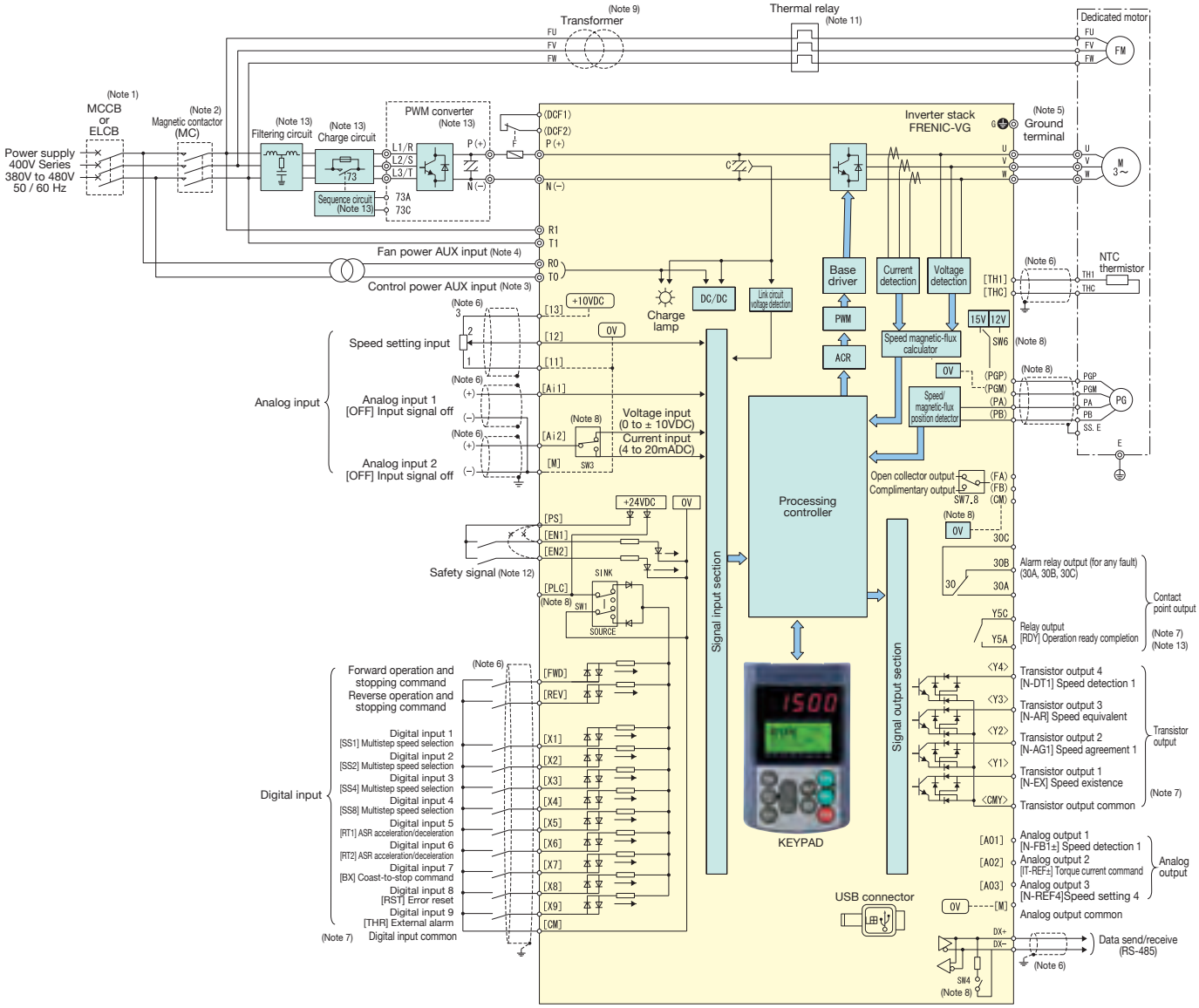
(Note13) The cooling fan power supply of the motor with 7.5kW or less is single-phase. Connect the terminal FU and FV. The cooling fan of the 400V series motor with 7.5kW or less is 200V / 50Hz and 200 to 230V / 60Hz. The cooling fan of the 400V series motor with 11kW or more is 400 to 420V / 50Hz and 400 to 440V / 60Hz. When using the cooling fan with a voltage other than these, use a transformer.

(Note14) The 0V ([M], [11], [THC]) and 0V ([CM]) are insulated inside the inverter.

(Note15) Confirm by using thermal relay manual recovery that auxiliary contact of thermal relay can trip the line circuit breaker (MCCB) or electromagnetic contactor (MC)

(Note16) A short-circuit conductor is connected between the safety function terminals [EN1] [EN2] and [PS] as the factory default. To use this function, remove the short-circuit conductor before connection.

Basic Wiring Diagram

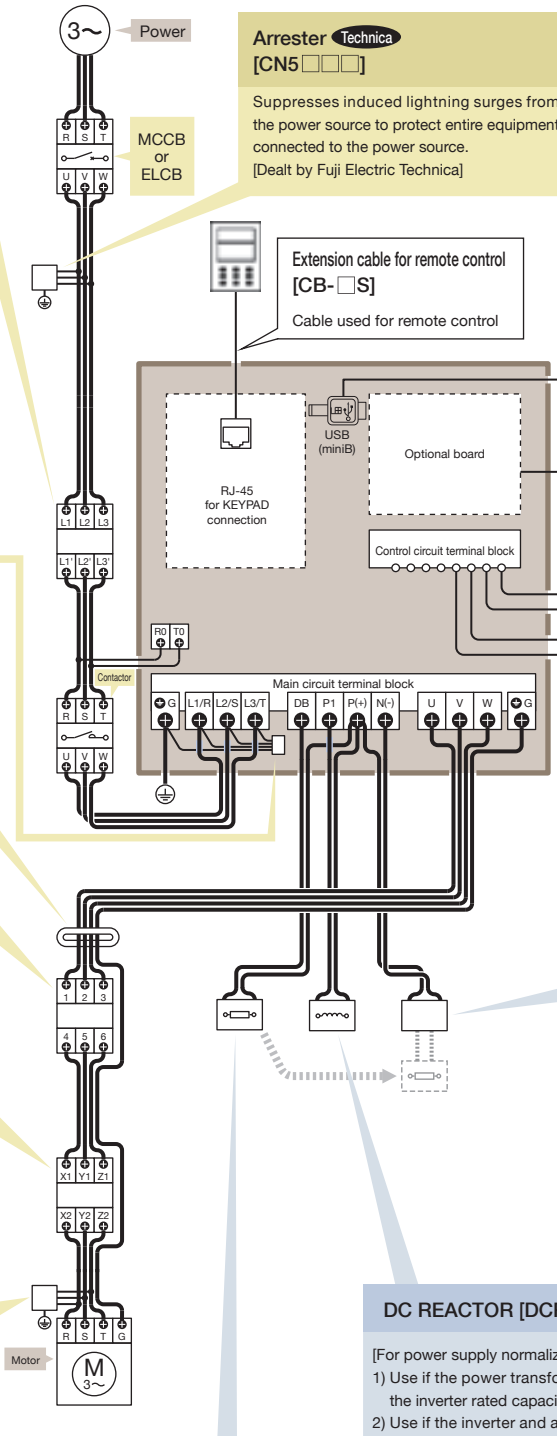


(Note 1) For line protection, the input (primary) side of each converter should be equipped with a recommended line circuit breaker (MCCB) or earth leakage circuit breaker (ELCB) with an intercurrence protector. Do not use a circuit breaker whose capacity exceeds the recommended capacity.
(Note 2) Provide an electromagnetic contactor (MC) recommended for each converter to shut off the converter from the power supply (in addition to the MCCB or ELCB). When the MC, solenoid, or other coil is installed near the converter, a surge absorber should be connected in parallel with it.
(Note 3) Connect this terminal to the power supply when you want to retain all alarm signals when the protection works although you shut off the main power supply of the inverter or to display always the Keypad. You can run the inverter without supplying power to this terminal.
(Note 4) Connect this when the inverter capacity is 90kW or more.
(Note 5) This is a motor grounding terminal.
(Note 6) The wires indicated by should be twisted or shielded wires.Basically the shield of the shielded wire is connected to the ground, but can be connected to 0V ([M], [11], [THC]) or 0V ([CM] to suppress noises. This wire should be separated as far as possible (10cm or more preferentially) from the main circuit wires and should not be laid in a conduit together with them. When crossing the main circuit wires, the shielded wire should be approximately perpendicular to them.
(Note 7) The functions of Terminals [X1] to [X9] (digital inputs), Terminals [Y1] to [Y4] (transistor outputs),and terminal [Y5A/C] are assigned in the factory.
(Note 8) Changeover switch on the control printed circuit board
(Note 9) The power to the motor cooling fan is 400 to 420 V / 50 Hz or 400 to 440 / 60 Hz. If you use other voltages, it must be adjusted by using a transformer.
(Note 10) 0V ([M], [11], [THC]) and 0V ([CM]) are insulated in the inverter.
(Note 11) Confirm that auxiliary contact (manual recovery) of thermal relay can trip the line circuit breaker (MCCB) or electromagnetic contactor (MC)
(Note 12) The safety function terminals [EN1][EN2] and [PS] are initially short-connected with conductors.Remove these short-connecting terminals when using the safety function.
(Note 13) PWM converters of 280kW or larger are connected differently. For connection of the PWM converter and the charging circuit, see the PWM converter instruction manual.

Options

Option guides (Example of unit type)

For main power input and inverter output



Arrester Technica
[CN5□□□]

Suppresses induced lightning surges from the power source to protect entire equipment connected to the power source.
[Dealt by Fuji Electric Technica]

PC loader for Windows Inverter support software (FRENIC-VG loader)

This software is used to set the function codes of the inverter from a PC, to manage the data. ("WPS-VG1-STR" is available as free download from our website.)

Extension cable for remote control [CB-□S]

Cable used for remote control

Battery for memory backup, storing trace back memory and calendar function [OPK-BP]

22kW: optional, 30kW or more:standard equipment

EMC compliance filter (coming soon) [EFL-□□□, FS□□, FN□□]

Dedicated filter to comply with the European EMC Directive (Emission). Install the filter while referring to the details in the installation manual.

Power filter for input circuit Technica **[RNF□C□□-□□]**

This filter can be used for the same purpose as the EMC compliance filter, but is not an EMC compliance.

Filter capacitor for reducing radio noise Technica **[NFM□□M315KPD□]**

Used to reduce radio noise. This is effective for the AM radio frequency band.
*Do not use it on the inverter output side.
[Made by Nippon Chemi-con, dealt by Fuji Electric Technica]

Ferrite ring for reducing radio noise [ACL-40B, ACL-74B, F200160]

Used to reduce radio noise. Suppressive effect to the frequency band is available by approximately 1MHz or more. This is appropriate as a simple measure against noise since it affects broad range in the frequency band.It is recommended to insert it on the power supply side if the cable length between a motor and an inverter is short (roughly 20m or less) or on the output side if the cable length exceeds 20m.

Power filter for output circuit Technica **[RNF□S□□-□□]**

This will become more effective in noise reduction if used together with the power filter for input circuit.

Output circuit filter [OFL-□□□-4A]

Connected to the output of an inverter to:
- Suppress fluctuations of motor terminal voltage.
- Prevent damages to the motor insulation due to surge voltage in 400V series inverter.

*This filter is not limited by carrier frequency. Also, motor can be tuned while this option is installed.

Surge supperession unit [SSU □□□TA-NS]

Surge voltage is generated if the cable between an inverter and a motor is several ten meters long. This product suppresses the surge voltage, preventing the motor from being damaged.

Surge killer

Absorbs surge voltage coming from L-load of magnetic contactor and solenoid valve to protect electronic devices from malfunctioning.

Surge absorber Technica
(Connect in parallel to the coil that is a generation source of surge.)

[S2-A-O (for magnetic contactor and solenoid valve)]
[S1-B-O (for mini control relay and timer)]

Surge killer for L-load
(Connect to the power circuit that is a generation source of surge.)

[FSL-323 (for 3-phase)]
[FSL-123 (for single -phase)]

Braking unit [BU□□-□C]

To be used together with a braking resistor to increase the inverter braking performance.

Power regenerative PMW converter, RHC series [RHC□□-□C]

Used for suppressing power source harmonics of inverters. It is also equipped with a power supply regenerative function to drastically increase braking capability and reduce energy consumption.

* Use in combination with dedicated reactors for the RHC series.

Dedicated filter for the RHC series

Dedicated filter for the RHC series is used if other electronic equipment is connected to the same power source.

*Use in combination with dedicated filter reactors, filter capacitors and filter resistors.

DC REACTOR [DCR□-□□□]

[For power supply normalization]
1) Use if the power transformer capacity is 500kVA or more and exceeds the inverter rated capacity by 10 times.
2) Use if the inverter and a thyristor converter are connected to the same transformer.

*Check if the thyristor converter uses a commutation reactor. If not,an AC reactor must be connected to the power supply side.

3) Connect to prevent trips when trip occurs due to opening/closing of the phase-advancing capacitor for the power supply lines.
4) Use if the voltage unbalance exceeds 2%.

[For improving the input power-factor and reducing harmonics]
● Used to reduce the input harmonic current (correcting power-factor)

* For the drop effect, refer to the guideline appendix.

Braking resistor [DB□□V-□□]

Increases braking capability for highly frequent stopping and large moment of inertia. When used together with a braking unit, connect this to the connection terminal of the braking unit.

Peripheral and structure options

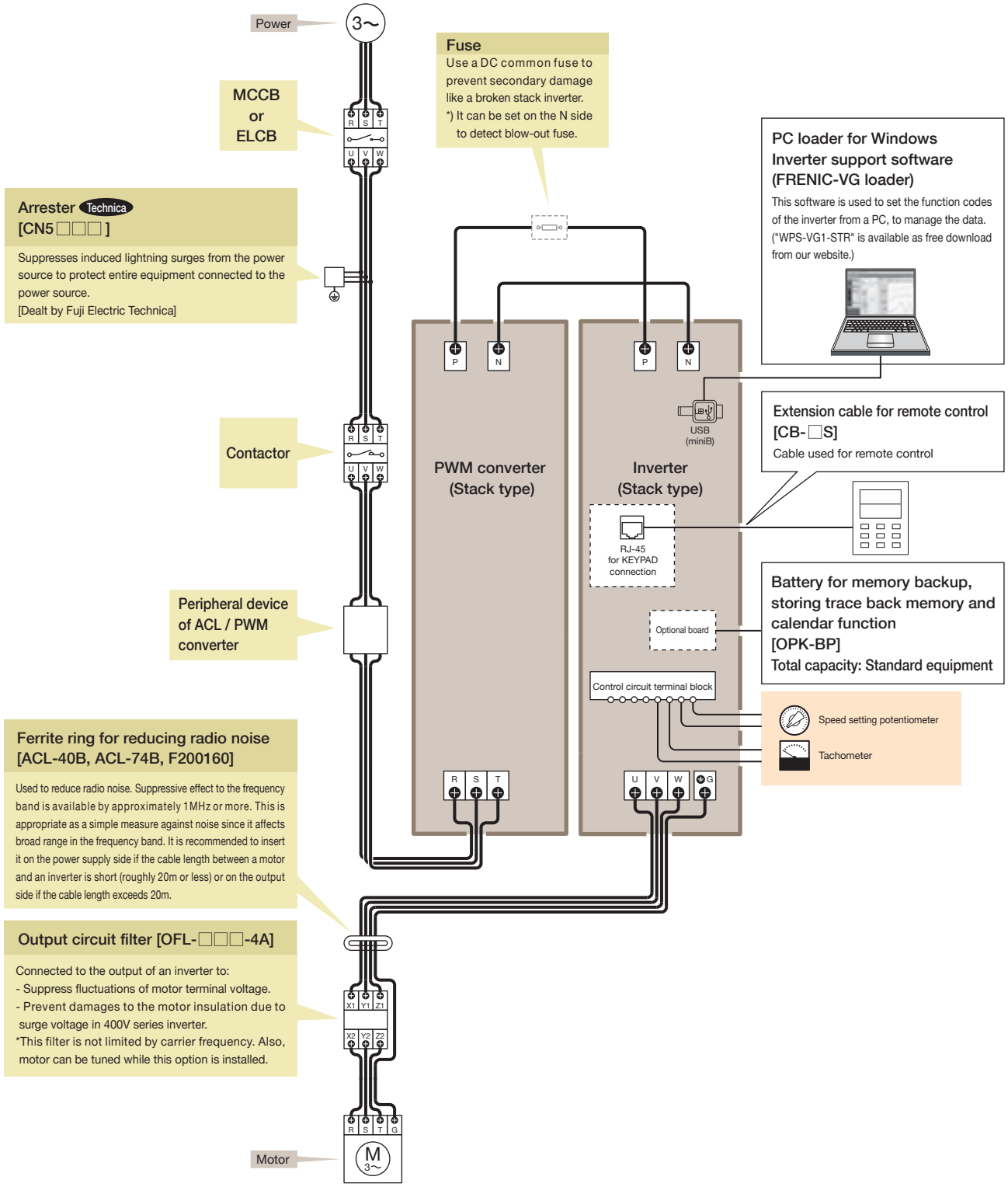
Attachment for external cooling

The attachment to install the heat sink part of the inverter outside the panel. [PBVG7-7.5 (for up to 7.5kW)] [PB-F1-30 (for 11 to 22kW)]

* The items indicated with Technica are dealt by Fuji Electric Technica.

Option guides (Example of stack type)

For main power input and inverter output


Power
3~
MCCB or ELCB
Fuse
Use a DC common fuse to prevent secondary damage like a broken stack inverter.
*) It can be set on the N side to detect blow-out fuse.
PC loader for Windows
Inverter support software
(FRENIC-VG loader)
This software is used to set the function codes of the inverter from a PC, to manage the data. ("WPS-VG1-STR" is available as free download from our website.)
Arrester Technica
[CN5□□□]
Suppresses induced lightning surges from the power source to protect entire equipment connected to the power source.
[Dealt by Fuji Electric Technica]
R S T
U V W
P N
USB (miniB)
Extension cable for remote control
[CB-□S]
Cable used for remote control
Contactor
PWM converter (Stack type)
Inverter (Stack type)
RJ-45 for KEYPAD connection
Peripheral device of ACL / PWM converter
Optional board
Battery for memory backup, storing trace back memory and calendar function
[OPK-BP]
Total capacity: Standard equipment
Control circuit terminal block
Speed setting potentiometer
Tachometer
G
Ferrite ring for reducing radio noise
[ACL-40B, ACL-74B, F200160]
Used to reduce radio noise. Suppressive effect to the frequency band is available by approximately 1MHz or more. This is appropriate as a simple measure against noise since it affects broad range in the frequency band. It is recommended to insert it on the power supply side if the cable length between a motor and an inverter is short (roughly 20m or less) or on the output side if the cable length exceeds 20m.
Output circuit filter [OFL-□□□-4A]
Connected to the output of an inverter to:
- Suppress fluctuations of motor terminal voltage.
- Prevent damages to the motor insulation due to surge voltage in 400V series inverter.
*This filter is not limited by carrier frequency. Also, motor can be tuned while this option is installed.
X1 Y1 Z1
X2 Y2 Z2
Motor
M
3~

* The items indicated with Technica are dealt by Fuji Electric Technica.

Options

Optional card

Category	Name	Type	Switch with SW on the Pt board	Specifications	Remarks
Analog card	Synchronized interface*1	OPC-VG1-SN		Synchronizing interface circuits for dancer control	coming soon
	F/V converter	OPC-VG1-FV		F/V converter	coming soon
	Aio extension card	OPC-VG1-AIO		Extension card of Ai 2 points + Ao 2 points	
Digital card (for 8 bit bus)	Di interface card	OPC-VG1-DI	OPC-VG1-DI (A)	16 bit Di of binary or 4-digit BCD + sign	
			OPC-VG1-DI (B)	For setting the speed, torque and the torque current reference.	
	Dio extension card	OPC-VG1-DIO	OPC-VG1-DIO (A)	Extension of Di (4bits) and Do (8bits) for function selection. Dio option card for direct landing control. Di × 16 bit + Do ×10 bit	
			OPC-VG1-DIO (B)	UPAC exclusive use	coming soon
	PG interface expansion card	OPC-VG1-PG	OPC-VG1-PG (SD)	+ 5V line driver type, voltage output PGs (A,B and Z-phase signals). Used for detecting motor speed, line speed, position reference and position detection.	
			OPC-VG1-PG (LD)		
			OPC-VG1-PG (PR)		
			OPC-VG1-PG (PD)		
		OPC-VG1-PGo	OPC-VG1-PGo (SD)	Open collector type voltage output PGs (A,B and Z-phase signals). Used for detecting motor speed, line speed, position reference and position detection.	
			OPC-VG1-PGo (LD)		
			OPC-VG1-PGo (PR)		
			OPC-VG1-PGo (PD)		
		OPC-VG1-SPGT		ABS encoder with 17 bit high resolution	
	PG card for synchronous motor drive	OPC-VG1-PMPG		+5V line driver type / A, B + magnetic pole position (Max. 4bit)	
		OPC-VG1-PMPGo		Open collector type / A, B + magnetic pole position (Max. 4bit)	
	T-Link interface card	OPC-VG1-TL		T-Link interface card	
	CC-Link interface card	OPC-VG1-CCL		CC-Link compliant card (Ver2.00)	
	High-speed serial connections for UPAC	OPC-VG1-SIU		Use for UPAC communication system	coming soon
Digital card (for 16 bit bus)	SX bus communication card	OPC-VG1-SX		SX bus communication card	
	E-SX bus communication card	OPC-VG1-ESX		E-SX bus communication card	
	PROFINET-IRT	OPC-VG1-PNET		PROFINET-IRT communication card	coming soon
	User Programmable Application Card	OPC-VG1-UPAC		Technology card	coming soon
Fieldbus interface card	PROFIBUS-DP	OPC-VG1-PDP		PROFIBUS-DP interface card	coming soon
	DeviceNet	OPC-VG1-DEV		DeviceNet interface card	coming soon
Safety card	Functional safety card	OPC-VG1-SAFE		Safety standard compliant card	
Control circuit terminal	Terminal block for high-speed serial communications	OPC-VG1-TBSI		Used for multiple-winding motor drive system, reactor connection system	
Loader	Inverter support loader	WPS-VG1-STR		For Windows. (Free version)	
		WPS-VG1-PCL		For Windows. (Paid version)	
Package software	Tension control software	WPS-VG1-TEN		For Windows. Supplied with inverter support loader (Paid) CD-ROM.	coming soon
	Dancer control software	WPS-VG1-DAN			coming soon
	Position control software	WPS-VG1-POS			coming soon

Cable

Category	Name	Type	Length (m)	Specifications
Cable	Extension cable for remote control	CB-5S	5m	Connection cable between an inverter and the KEYPAD panel
		CB-3S	3m	
		CB-1S	1m	
	Encoder cable for GNF2	CB-VG1-PMPG-05S	5m	Straight plug
		CB-VG1-PMPG-15S	15m	
		CB-VG1-PMPG-30S	30m	
		CB-VG1-PMPG-50S	50m	
		CB-VG1-PMPG-05A	5m	Angle plug
		CB-VG1-PMPG-15A	15m	
		CB-VG1-PMPG-30A	30m	
		CB-VG1-PMPG-50A	50m	

Combination with built-in control option

Category		Maximum installable number					
		Pattern 1	Pattern 2	Pattern 3	Pattern 4	Pattern 5	Pattern 6
Analog card		1	0	1	0	1	0
Digital card (for 8 bit bus)	OPC-VG1-TL,CCL	0	0	1	2	0	1
	Other	1	2				
Digital card (for 16 bit bus)	OPC-VG1-SX,E-SX	1	1	0	0	0	0
	OPC-VG1-UPAC	0	0	1	1	1	1
Field bus interface card		0	0	0	0	1	1
Safety card		1					
Control circuit terminal		1					

(1) When you use OPC-VG1-PG for detecting motor speed, the input from the terminals (PA, PB) on the control PC board of the main unit is disabled.
(2) When you install OPC-VG1-PMPG, you should select terminals according to the control method.
The terminals (PA, PB) on the control PC board of the main unit are enabled if vector control for induction motor with speed sensor is selected.
The OPC-VG1-PMPG is enabled if vector control for synchronous motor with speed sensor is selected.
(3) More than one optional communication card (i.e., OPC-VG1-TL and OPC-VG1-CCL) installation at a time is not available. If these cards are installed at the same time, an operation procedure error (Er6) is indicated. However, only the combination of OPC-VG1-TL and OPC-VG1-SX can be used at the same time.
(4) The usage of the OPC-VG1-DI, DIO, PG and PGo can be selected by setting the SW on the PCB. 2 cards of each of the types OPC-VG1-DI, DIO, PG and PGo can be installed, but if the SWs for selecting the usage mode are set to the same setting, an operation procedure error (Er6) is indicated.
(5) The OPC-VG1-AIO (analog) and OPC-VG1-SPGT (digital 8-bit) cannot be installed at the same time.
(6) The PG interface card (OPC-VG1-PG/PGo) has the restrictions shown in the table below.

	VG1-PG/PGo (SD)	VG1-PG/PGo (LD)	VG1-PG/PGo (PR)	VG1-PG/PGo (PD)
VG1-PG/PGo (SD)	NG	OK	OK	OK
VG1-PG/PGo (LD)	OK	NG	OK	OK
VG1-PG/PGo (PR)	OK	NG	NG	OK
VG1-PG/PGo (PD)	OK	NG	NG	NG

Braking resistor, braking unit (max. 150% torque, 10% ED)

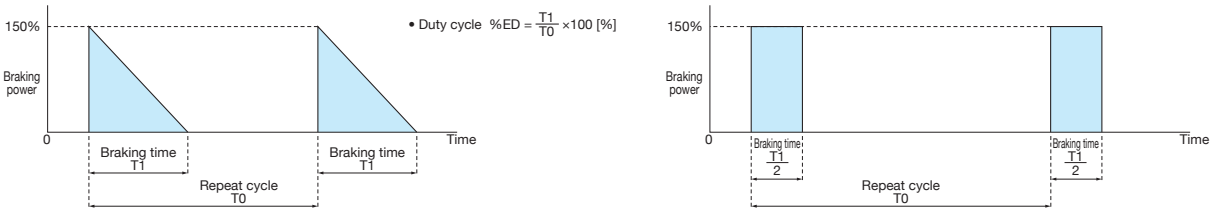
Power supply voltage	Nominal applied motor [kW]	Inverter type	Braking unit		Braking resistor			Continuous braking (150% torque conversion value)			Repetitive braking (100s or less cycle)	
			For unit type									
		Unit type * (HD spec)	Type	Q'ty	Type	Ohmic value	Q'ty	Max. braking torque [%]	Braking time [s]	Discharging capability [kWs]	Duty cycle [%ED]	Average loss [kW]
3-phase 200V	0.75	FRN0.75VG1S-2□	Built-in unit		DB2.2V-21B	30Ω	1	150%	10s	16.5	10%ED	**0.165**
	1.5	FRN1.5VG1S-2□										
	2.2	FRN2.2VG1S-2□										
	3.7	FRN3.7VG1S-2□			DB3.7V-21B	24Ω	1			27.75		**0.2775**
	5.5	FRN5.5VG1S-2□			DB5.5V-21B	16Ω	1			41.25		**0.4125**
	7.5	FRN7.5VG1S-2□			DB7.5V-21B	12Ω	1			56.25		**0.5625**
	11	FRN11VG1S-2□			DB11V-21B	8Ω	1			82.5		**0.825**
	15	FRN15VG1S-2□			DB15V-21B	6Ω	1			112.5		**1.125**
	18.5	FRN18.5VG1S-2□			DB18.5V-21B	4.5Ω	1			138.75		**1.3875**
	22	FRN22VG1S-2□			DB22V-21B	4Ω	1			165		**1.65**
	30	FRN30VG1S-2□			DB30V-21B	2.5Ω	1			225		**2.25**
	37	FRN37VG1S-2□			DB37V-21B	2.25Ω	1			277.5		**2.775**
	45	FRN45VG1S-2□			DB45V-21B	2Ω	1			337.5		**3.375**
	55	FRN55VG1S-2□			DB55V-21C	1.6Ω	1			412.5		**4.125**
	75	FRN75VG1S-2□	BU55-2C	2	DB75V-21C	2.4/2Ω	1			562.5		**5.625**
	90	FRN90VG1S-2□	BU90-2C	2	DB90V-21C	2/2Ω	1			675		**6.75**
3-phase 400V	3.7	FRN3.7VG1S-4□	Built-in unit		DB3.7V-41B	96Ω	1	150%	10s	27.75	10%ED	**0.2775**
	5.5	FRN5.5VG1S-4□			DB5.5V-41B	64Ω	1			41.25		**0.4125**
	7.5	FRN7.5VG1S-4□			DB7.5V-41B	48Ω	1			56.25		**0.5625**
	11	FRN11VG1S-4□			DB11V-41B	32Ω	1			82.5		**0.825**
	15	FRN15VG1S-4□			DB15V-41B	24Ω	1			112.5		**1.125**
	18.5	FRN18.5VG1S-4□			DB18.5V-41B	18Ω	1			138.75		**1.3875**
	22	FRN22VG1S-4□			DB22V-41B	16Ω	1			165		**1.65**
	30	FRN30VG1S-4□			DB30V-41B	10Ω	1			225		**2.25**
	37	FRN37VG1S-4□			DB37V-41B	9Ω	1			277.5		**2.775**
	45	FRN45VG1S-4□			DB45V-41B	8Ω	1			337.5		**3.375**
	55	FRN55VG1S-4□			DB55V-41C	6.5Ω	1			412.5		**4.125**
	75	FRN75VG1S-4□			DB75V-41C	4.7Ω	1			562.5		**5.625**
	90	FRN90VG1S-4□			DB90V-41C	3.9Ω	1			675		**6.75**
	110	FRN110VG1S-4□			DB110V-41C	3.2Ω	1			825		**8.25**
	132	FRN132VG1S-4□			DB132V-41C	2.6Ω	1			990		**9.9**
	160	FRN160VG1S-4□			DB160V-41C	2.2Ω	1			1200		**12.0**
	200	FRN200VG1S-4□	BU220-4C	2	DB200V-41C	3.5/2Ω	1			1500		**15.0**
	220	FRN220VG1S-4□			DB220V-41C	3.2/2Ω	1			1650		**16.5**
	250	–	–	–								
	280	FRN280VG1S-4□	BU220-4C	2	DB160V-41C	2.2/2Ω	2			2100		**21.0**
	315	FRN315VG1S-4□			DB160V-41C	2.2/2Ω	2			2363		**23.6**
	355	FRN355VG1S-4□	BU220-4C	3	DB132V-41C	2.6/3Ω	3			2663		**26.6**
	400	FRN400VG1S-4□			DB132V-41C	2.6/3Ω	3			3000		**30.0**
	500	FRN500VG1S-4□		4	DB132V-41C	2.6/4Ω	4			3750		**37.5**
	630	FRN630VG1S-4□			DB160V-41C	2.2/4Ω	4			4725		**47.3**
	710	–	–	–								
	800	–	–	–								

* For the unit type (MD / LD) specification and stack type (LD) specification, refer to the User Manual.

(Note 1) The duty cycle [%ED] are calculated as the 150% torque braking used for deceleration as described below.

(Note 2) Two braking resistors are required for each of DB160V-41C, DB200V-41C, or DB220V-41C.

(Note 3) When connecting three braking units or more in parallel, refer to the supplement document of the DB Unit instruction manual (notes in connecting multiple units) INR-HF51614.



[Selection procedure] All three conditions listed below must be satisfied simultaneously.

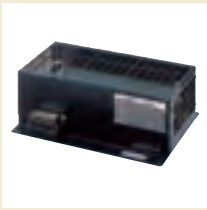
1 "The maximum braking torque" does not exceed the value shown on the table.

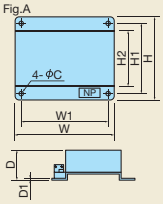
2 The energy discharged in the resistor for each braking (the area of the triangle shown in the above figure) does not exceed "the discharging capability [kWs]" on the table.

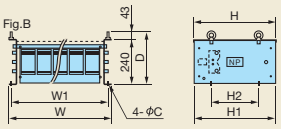
3 The average loss (energy discharged in the resistor divided by the braking interval) does not exceed "the average loss [kW]" shown on the table.

Options

Braking resistor (max.150% torque, 10%ED Spec.)







200V Series

Type	Fig	Dimensions [mm]								Approx. weight [kg]
		W	W1	H	H1	H2	D	D1	C	
DB2.2V-21B	A	330	298	242	210	165	140	1.6	8	4
DB3.7V-21B		400	368	280	248	203	140	1.6	8	5
DB5.5V-21B		400	368	280	248	203	140	1.6	8	5
DB7.5V-21B		400	368	480	448	377	140	1.6	10	6
DB11V-21B		400	368	480	448	377	140	1.6	10	7
DB15V-21B		400	368	660	628	557	140	1.6	10	10
DB18.5V-21B		400	368	660	628	557	140	1.6	10	10
DB22V-21B		400	368	660	628	557	240	1.6	10	13
DB30V-21B		400	368	660	628	557	240	1.6	10	18
DB37V-21B		405	368	750	718	647	240	1.6	10	22
DB45V-21B		405	368	750	718	647	340	1.6	10	26
DB55V-21C	B	450	420	440	430	250	283	–	12	35
DB75V-21C		600	570	440	430	250	283	–	12	33
DB90V-21C		700	670	440	430	250	283	–	12	43

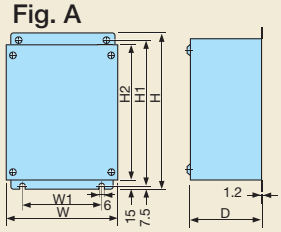
400V Series

Type	Fig	Dimensions [mm]								Approx. weight [kg]
		W	W1	H	H1	H2	D	D1	C	
DB3.7V-41B	A	420	388	280	248	203	140	1.6	8	5
DB5.5V-41B		420	388	480	448	377	140	1.6	10	7
DB7.5V-41B		420	388	480	448	377	140	1.6	10	7
DB11V-41B		420	388	480	448	377	140	1.6	10	8
DB15V-41B		420	388	660	628	557	140	1.6	10	11
DB18.5V-41B		420	388	660	628	557	140	1.6	10	11
DB22V-41B		420	388	660	628	557	240	1.6	10	14
DB30V-41B		420	388	660	628	557	240	1.6	10	19
DB37V-41B		425	388	750	718	647	240	1.6	10	21
DB45V-41B		425	388	750	718	647	340	1.6	10	26
DB55V-41C	B	550	520	440	430	250	283	–	12	26
DB75V-41C		550	520	440	430	250	283	–	12	30
DB90V-41C		650	620	440	430	250	283	–	12	41
DB110V-41C		750	720	440	430	250	283	–	12	57
DB132V-41C		750	720	440	430	250	283	–	12	43
*DB160V-41C		600	570	440	430	250	283	–	12	37(×2)
*DB200V-41C		725	695	440	430	250	283	–	12	50(×2)
*DB220V-41C		725	695	440	430	250	283	–	12	51(×2)

* For DB160V-41C, DB200V-41C, and DB220V-41C, a pair of resistors of the same type is used.
Be sure to secure the space for installation. A pair of resistors is shipped for the order of one unit.

Braking unit (BU□□-□)

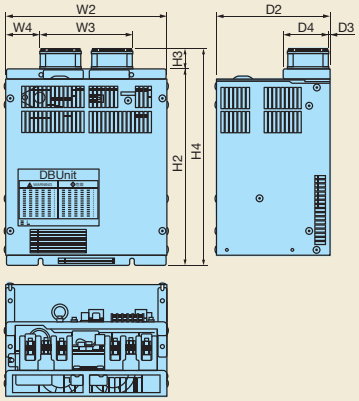
Fig. A



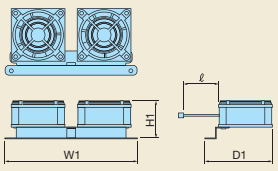
Voltage	Type	Fig	Dimensions [mm]						Approx. weight [kg]
			W	W1	H	H1	H2	D	
3-phase 200V	BU55-2C	A	230	130	240	225	210	160	6
	BU90-2C	A	250	150	370	355	340		9
3-phase 400V	BU37-4C	A	150	100	280	265	250	160	4
	BU55-4C	A	230	130	280	265	250		5.5
	BU90-4C	A	230	130	280	265	250		5.5
	BU132-4C	A	250	150	370	355	340		9
	BU220-4C	A	250	150	450	435	420		13

Fan unit for braking unit (BU-F)

■Braking unit + Fan unit



■Fan unit



The duty cycle [%ED] of the model with an external braking unit is increased from 10% ED to 30% ED by using this option.

[Fan unit]

Type	Dimensions [mm]			
	W1	H1	D1	ℓ (Fan power supply cable)
BU-F	149	44	76	320

[Braking unit + Fan unit]

Voltage	Type	Dimensions [mm]								
		W2	W3	W4	H2	H3	H4	D2	D3	D4
3-phase 200V	BU55-2C+BU-F	230	135	47.5	240	30	270	160	1.2	64
	BU90-2C+BU-F	250		57.5	370		400			
3-phase 400V	BU37-4C+BU-F	150	135	7.5	280	30	310	160	1.2	64
	BU55-4C+BU-F	230		47.5	280		310			
	BU90-4C+BU-F	230		47.5	280		310			
	BU132-4C+BU-F	250		57.5	370		400			
	BU220-4C+BU-F	250		57.5	450		480			

The DC reactor is mainly used for the unit type. With the stack type, the DC reactor is built into the diode converter and is used if necessary.
* For details, refer to the Stack Type User Manual.

DC Reactor (DCR□-□□□)

*For models with a standard motor of 75kW or more, it is included as a standard.

Fig. A

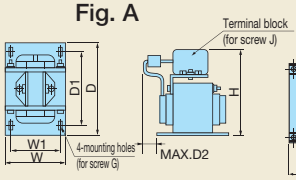


Fig. B

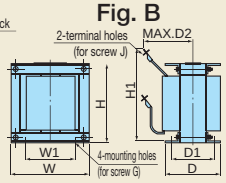


Fig. C

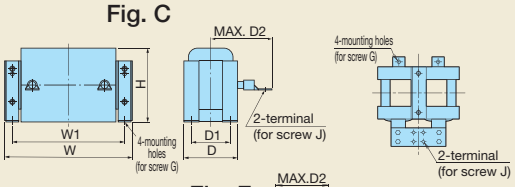


Fig. D

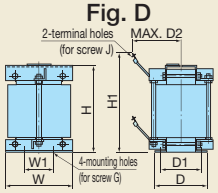


Fig. E

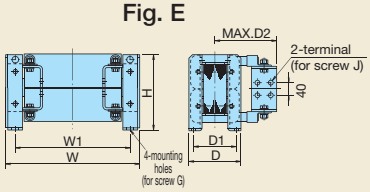
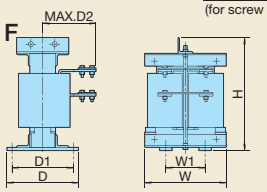


Fig. F



Voltage	Nominal applied motor [kW]	Inverter Type			REACTOR Type	Fig	Dimensions [mm]									Approx. weight [kg]
		HD Specification	MD Specification	LD Specification			W	W1	D	D1	D2	G	H	H1	J	
3-phase 200V	0.75	FRN0.75VG1S-2□	–	–	DCR2-0.75	A	66	56	90	72	20	M4(5.2×8)	94	–	M4	1.4
	1.5	FRN1.5VG1S-2□	–	–	DCR2-1.5		66	56	90	72	20	M4(5.2×8)	94	–	M4	1.6
	2.2	FRN2.2VG1S-2□	–	–	DCR2-2.2		86	71	100	80	10	M5(6×9)	110	–	M4	1.8
	3.7	FRN3.7VG1S-2□	–	–	DCR2-3.7		86	71	100	80	20	M5(6×9)	110	–	M4	2.6
	5.5	FRN5.5VG1S-2□	–	–	DCR2-5.5		111	95	100	80	20	M6(7×11)	130	–	M5	3.6
	7.5	FRN7.5VG1S-2□	–	–	DCR2-7.5		111	95	100	80	23	M6(7×11)	130	–	M5	3.8
	11	FRN11VG1S-2□	–	–	DCR2-11		111	95	100	80	24	M6(7×11)	137	–	M6	4.3
	15	FRN15VG1S-2□	–	–	DCR2-15		146	124	120	96	15	M6(7×11)	180	–	M8	5.9
	18.5	FRN18.5VG1S-2□	–	–	DCR2-18.5		146	124	120	96	25	M6(7×11)	180	–	M8	7.4
	22	FRN22VG1S-2□	–	–	DCR2-22A		146	124	120	96	25	M6(7×11)	180	–	M8	7.5
	30	FRN30VG1S-2□	–	–	DCR2-30B	B	152	90	156	116	115	M6(Φ8)	130	190	M10	12
	37	FRN37VG1S-2□	–	FRN30VG1S-2□	DCR2-37B	B	171	110	151	110	115	M6(Φ8)	150	200	M10	14
			–		DCR2-37C	C	210	185	101	81	125	M6(7×13)	125	–	M10	7.4
	45	FRN45VG1S-2□	–	FRN37VG1S-2□	DCR2-45B	B	171	110	166	125	120	M6(8)	150	200	M10	16
			–		DCR2-45C	C	210	185	106	86	135	M6(7×13)	125	–	M12	8.4
	55	FRN55VG1S-2□	–	FRN45VG1S-2□	DCR2-55B	D	190	160	131	90	100	M6(Φ8)	210	250	M12	16
			–		DCR2-55C	C	255	225	96	76	140	M6(7×13)	145	–	M12	11
	75	FRN75VG1S-2□	–	FRN55VG1S-2□	DCR2-75C	C	255	225	106	86	145	M6(7×13)	145	–	M12	12
	90	FRN90VG1S-2□	–	FRN75VG1S-2□	DCR2-90C		255	225	116	96	155	M6(7×13)	145	–	M12	14
	110	–	–	FRN90VG1S-2□	DCR2-110C		300	265	116	90	185	M8(10×18)	160	–	M12	17
3-phase 400V	3.7	FRN3.7VG1S-4□	–	–	DCR4-3.7	A	86	71	100	80	20	M5(6×9)	110	–	M4	2.6
	5.5	FRN5.5VG1S-4□	–	–	DCR4-5.5		86	71	100	80	20	M5(6×9)	110	–	M4	2.6
	7.5	FRN7.5VG1S-4□	–	–	DCR4-7.5		111	95	100	80	24	M6(7×11)	130	–	M5	4.2
	11	FRN11VG1S-4□	–	–	DCR4-11		111	95	100	80	24	M6(7×11)	130	–	M5	4.3
	15	FRN15VG1S-4□	–	–	DCR4-15		146	124	120	96	15	M6(7×11)	168	–	M5	5.9
	18.5	FRN18.5VG1S-4□	–	–	DCR4-18.5		146	124	120	96	25	M6(7×11)	171	–	M6	7.2
	22	FRN22VG1S-4□	–	–	DCR4-22A		146	124	120	96	25	M6(7×11)	171	–	M6	7.2
	30	FRN30VG1S-4□	–	–	DCR4-30B	B	152	90	157	115	100	M6(Φ8)	130	190	M8	13
	37	FRN37VG1S-4□	–	FRN30VG1S-4□	DCR4-37B	B	171	110	150	110	100	M6(Φ8)	150	200	M8	15
			–		DCR4-37C	C	210	185	101	81	105	M6(7×13)	125	–	M8	7.4
	45	FRN45VG1S-4□	–	FRN37VG1S-4□	DCR4-45B	B	171	110	165	125	110	M6(Φ8)	150	210	M8	18
			–		DCR4-45C	C	210	185	106	86	120	M6(7×13)	125	–	M8	8.4
	55	FRN55VG1S-4□	–	FRN45VG1S-4□	DCR4-55B	B	171	110	170	130	110	M6(Φ8)	150	210	M8	20
			–		DCR4-55C	C	255	225	96	76	120	M6(7×13)	145	–	M10	11
	75	FRN75VG1S-4□	–	FRN55VG1S-4□	DCR4-75C	C	255	225	106	86	125	M6(7×13)	145	–	M10	13
	90	FRN90VG1S-4□	–	FRN75VG1S-4□	DCR4-90C		255	225	116	96	140	M6(7×13)	145	–	M12	15
	110	FRN110VG1S-4□	FRN90VG1S-4□	FRN90VG1S-4□	DCR4-110C		300	265	116	90	175	M8(10×18)	155	–	M12	19
	132	FRN132VG1S-4□	FRN110VG1S-4□	FRN110VG1S-4□	DCR4-132C		300	265	126	100	180	M8(10×18)	160	–	M12	22
	160	FRN160VG1S-4□	FRN132VG1S-4□	FRN132VG1S-4□	DCR4-160C		350	310	131	103	180	M10(12×22)	190	–	M12	26
	200	FRN200VG1S-4□	FRN160VG1S-4□	FRN160VG1S-4□	DCR4-200C		350	310	141	113	185	M10(12×22)	190	–	M12	30
	220	FRN220VG1S-4□	FRN200VG1S-4□	FRN200VG1S-4□	DCR4-220C		350	310	146	118	200	M10(12×22)	190	–	M12	33
	250	–	FRN220VG1S-4□	–	DCR4-250C		350	310	161	133	210	M10(12×22)	190	–	M12	35
	280	FRN280VG1S-4□	–	FRN220VG1S-4□	DCR4-280C		350	310	161	133	210	M10(12×22)	190	–	M16	37
	315	FRN315VG1S-4□	FRN280VG1S-4□	–	DCR4-315C		400	345	146	118	200	M10(12×22)	225	–	M16	40
	355	FRN355VG1S-4□	FRN315VG1S-4□	FRN280VG1S-4□	DCR4-355C	E	400	345	156	128	200	M10(12×22)	225	–	4×M12	49
	400	FRN400VG1S-4□	FRN355VG1S-4□	FRN315VG1S-4□	DCR4-400C		445	385	145	117	213	M10(12×22)	245	–	4×M12	52
	450	–	FRN400VG1S-4□	FRN355VG1S-4□	DCR4-450C		440	385	150	122	215	M10(12×22)	245	–	4×M12	62
	500	FRN500VG1S-4□	–	FRN400VG1S-4□	DCR4-500C		445	390	165	137	220	M10(12×22)	245	–	4×M12	72
	630	FRN630VG1S-4□	–	FRN500VG1S-4□	DCR4-630C	F	285	145	203	170	195	M12(14×20)	480	–	2×M12	75
	710	–	–	FRN630VG1S-4□	DCR4-710C		340	160	295	255	225	M12(Φ15)	480	–	4×M12	95

•The DC Reactor (DCR) in thick-frame are provided as standard (supplied adding to the unit). The DC Reactor (DCR) is provided as standard for FRN55VG1S-2 and FRN55VG1S-4 of the LD specification, but not provided as standard for those units of HD specification.
*The DCR2/4- □□B type is also prepared for motors with 75kW or larger, which are applicable as standard. Contact us for ordering product separately.

DC Reactor Type	Remarks
Input power factor of DCR2/4-□□/□□A/□□B: approx. 90 to 95%	The symbol at the end of the type code varies depending on the capacity.
Input power factor of the DCR2/4-□□C: about 86 to 90%	This can be selected with the inverter of 37kW or more.

Options

AC Reactor (ACR□-□□□)

Fig. A

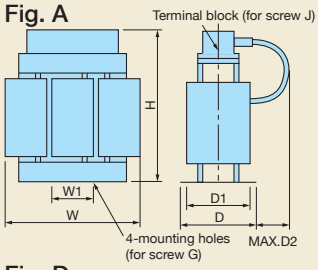


Fig. B

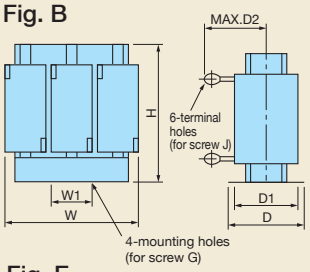


Fig. C

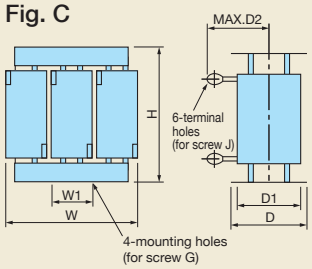


Fig. D

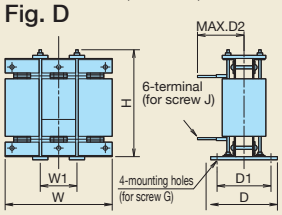
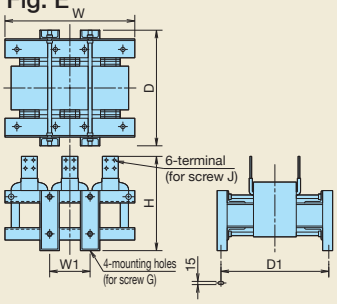


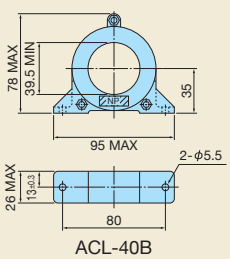
Fig. E



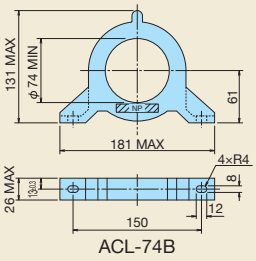
Voltage	Reactor Type	Fig. No.	Dimensions [mm]								Approx. weight [kg]
			W	W1	D	D1	D2	G	H	J	
3-phase 400V	ACR4-110	C	250	100	136	105	202	M8(9.5×18)	245	M12	24
	ACR4-132		250	100	146	115	207	M8(10×16)	250	M12	32
	ACR4-220		320	120	150	110	240	M10(12×20)	300	M12	40
	ACR4-280		380	130	150	110	260	M10(12×20)	300	M12	52
	ACR4-355		380	130	150	110	260	M10(12×20)	300	M12	52
	ACR4-450	D	460	155	290	230	200	M12(Φ15)	490	4×M12	95
	ACR4-530	E	480	155	420	370	–	M12(15×25)	380	4×M12	100
	ACR4-630		510	170	420	370	–	M12(15×25)	390	4×M12	110

Note) It is not necessary to use the reactor unless a particularly stable power supply is required, i.e., DC bus connection operation (PN connection operation).
Use the DC reactor (DCR) as a measure against harmonics.

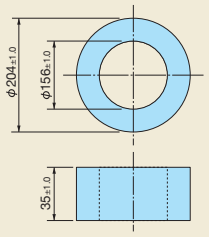
Zero-phase reactor for reducing radiated noise (ACL-40B, ACL-74B, F200160)



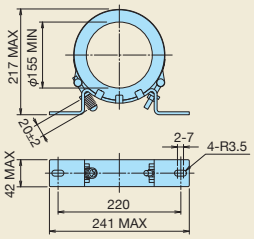
ACL-40B



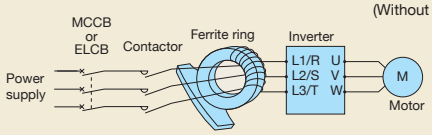
ACL-74B



F200160
(Without Mounting legs)



F200160PB
(With Mounting legs)



■Applied wire size list

Ferrite ring types for reducing radio noise	Q'ty	No. of turns	Recommended wire size [mm²] Note)
ACL-40B	1	4	2.0, 3.5, 5.5
	2	2	8, 14
ACL-74B	1	4	8, 14
	2	2	22, 38, 60, 5.5×2, 8×2, 14×2, 22×2
	4	1	100, 150, 200, 250, 325, 38×2, 60×2, 100×2, 150×2
F200160	4	1	200×2, 250×2, 325×2, 325×3
F200160PB	4	1	200×2, 250×2, 325×2, 325×3

NOTE) Use a 600V HIV insulation cable (Allowable temp. 75°C).

Options

Output circuit filter (OFL-□□□4A)[400V series]

■Filter dimensions (22kW or less)

Fig.A

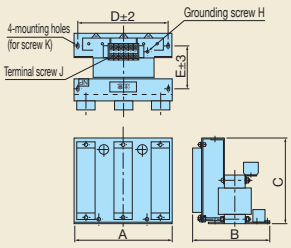
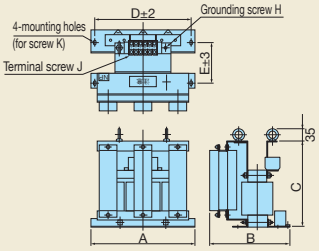


Fig. B



■Filter dimensions (30kW or more):reactor

Fig. C

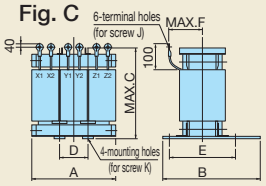


Fig. D

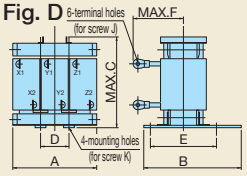
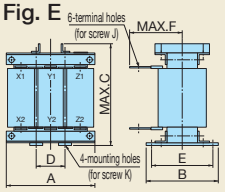
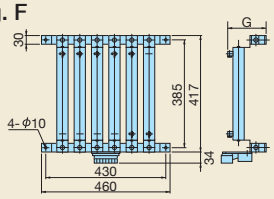


Fig. E



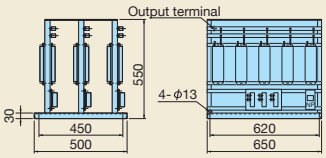
■Filter dimensions (30kW or more):resistor/capacitor

Fig. F



The reactor, capacitor and resistor for filter OFL-30-4A or larger have to be installed separately.
(Those items are not included in the mass indicated in the table below. They are shipped as a set by ordering the filter.)

Fig. G



Voltage	Nominal applied motor [kW]	Inverter Type					Filter Type	Fig	Dimensions [mm]										Approx. weight [kg]
		Unit Type			Stack Type				A	B	C	D	E	F	G	Grounding screw H	Terminal screw J	Mounting screw K	
		HD Specification	MD Specification	LD Specification	MD Specification	LD Specification													
3-phase 400V	3.7	FRN3.7VG1S-4□	–	–	–	–	OFL-3.7-4A	A	220	225	220	200	115	–	–	M4	M4	M5	14
	5.5	FRN5.5VG1S-4□	–	–	–	–	OFL-7.5-4A		290	290	230	260	160	–	–	M5	M5	M6	22
	7.5	FRN7.5VG1S-4□	–	–	–	–													
	11	FRN11VG1S-4□	–	–	–	–	OFL-15-4A	B	330	275	310	300	145	–	–	M6	M6	M8	35
	15	FRN15VG1S-4□	–	–	–	–													
	18.5	FRN18.5VG1S-4□	–	–	–	–	OFL-22-4A		330	300	330	300	170	–	–	M6	M6	M8	45
	22	FRN22VG1S-4□	–	–	–	–													
	30	FRN30VG1S-4□	–	–	FRN30SVG1S-4□	–	OFL-30-4A	C/F	210	175	210	70	140	90	160	–	M5	M6	12
	37	FRN37VG1S-4□	–	FRN30VG1S-4□	FRN37SVG1S-4□	FRN30SVG1S-4□	OFL-37-4A		220	190	220	75	150	95	160	–	M5	M6	15
	45	FRN45VG1S-4□	–	FRN37VG1S-4□	FRN45SVG1S-4□	FRN37SVG1S-4□	OFL-45-4A	D/F	220	195	265	70	155	140	160	–	M6	M8	17
	55	FRN55VG1S-4□	–	FRN45VG1S-4□	FRN55SVG1S-4□	FRN45SVG1S-4□	OFL-55-4A		260	200	275	85	160	150	160	–	M6	M8	22
	75	FRN75VG1S-4□	–	FRN55VG1S-4□	FRN75SVG1S-4□	FRN55SVG1S-4□	OFL-75-4A		260	210	290	85	170	150	233	–	M8	M10	25
	90	FRN90VG1S-4□	–	FRN75VG1S-4□	FRN90SVG1S-4□	FRN75SVG1S-4□	OFL-90-4A		260	210	290	85	170	155	233	–	M8	M10	28
	110	FRN110VG1S-4□	FRN90VG1S-4□	FRN90VG1S-4□	FRN110SVG1S-4□	FRN90SVG1S-4□	OFL-110-4A		300	230	330	100	190	170	233	–	M8	M10	38
	132	FRN132VG1S-4□	FRN110VG1S-4□	FRN110VG1S-4□	FRN132SVG1S-4□	FRN110SVG1S-4□	OFL-132-4A		300	240	340	100	200	170	233	–	M10	M10	42
	160	FRN160VG1S-4□	FRN132VG1S-4□	FRN132VG1S-4□	FRN160SVG1S-4□	FRN132SVG1S-4□	OFL-160-4A		300	240	340	100	200	180	233	–	M10	M10	48
	200	FRN200VG1S-4□	FRN160VG1S-4□	FRN160VG1S-4□	FRN200SVG1S-4□	FRN160SVG1S-4□	OFL-200-4A		320	270	350	105	220	190	333	–	M10	M12	60
	220	FRN220VG1S-4□	FRN200VG1S-4□	FRN200VG1S-4□	FRN220SVG1S-4□	FRN200SVG1S-4□	OFL-220-4A		340	300	390	115	250	190	333	–	M10	M12	70
	250	–	FRN220VG1S-4□	–	FRN250SVG1S-4□	FRN220SVG1S-4□	OFL-280-4A		350	300	430	115	250	200	333	–	M10	M12	78
	280	FRN280VG1S-4□	–	FRN220VG1S-4□	FRN280SVG1S-4□	FRN250SVG1S-4□													
	315	FRN315VG1S-4□	FRN280VG1S-4□	–	FRN315SVG1S-4□	FRN280SVG1S-4□	OFL-315-4A	E/G	440	275	450	150	230	170	–	–	M12	M12	90
	355	FRN355VG1S-4□	FRN315VG1S-4□	FRN280VG1S-4□	–	FRN315SVG1S-4□	OFL-355-4A		440	290	480	150	245	175	–	–	M12	M12	100
	400	FRN400VG1S-4□	FRN355VG1S-4□	FRN315VG1S-4□	–	–	OFL-400-4A		440	295	510	150	240	175	–	–	M12	M12	110
	450	–	FRN400VG1S-4□	FRN355VG1S-4□	–	–	OFL-450-4A		440	325	470	150	270	195	–	–	M12	M12	125
	500	FRN500VG1S-4□	–	FRN400VG1S-4□	–	–	OFL-500-4A		440	335	500	150	280	210	–	–	M12	M12	145
	630	FRN630VG1S-4□	–	FRN500VG1S-4□	FRN630BVG1S-4□	–	OFL-630-4A		480	355	560	150	280	245	–	–	M12	M12	170
	710	–	–	FRN630VG1S-4□	FRN710BVG1S-4□	FRN630BVG1S-4□	–		–	–	–	–	–	–	–	–	–	–	–
	800	–	–	–	FRN800BVG1S-4□	FRN710BVG1S-4□	–												
	1000	–	–	–	–	FRN800BVG1S-4□	–												

* Carrier frequency is not limited with OFL-*** -4A.

Power regenerative PWM converter (RHC series)

Features

■ Applied Guideline for Suppressing Harmonics

PWM control reduces harmonics current significantly, due to sinusoidal wave at power supply side.
According to "Guideline for Suppressing Harmonics by the Users Who Receive High Voltage or Special High Voltage" issued by the Ministry of Economy, Trade and Industry, the converter factor (Ki) can be set to "0" (meaning harmonics occurrence is 0) when combining with the inverter.

■ Possible to reduce power supply facility capacity

Its power-factor control realizes the same phase current as the power-supply phase-voltage. The equipment, thus, can be operated with the power-factor of almost "1."
This makes it possible to reduce the power transformer capacity and downsize the other devices, compared with those required without the converter.

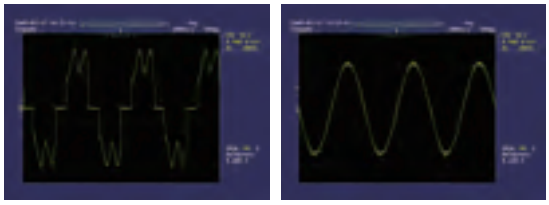
■ Upgraded braking performance

Regenerated energy occurring at highly frequent accelerating and decelerating operation and elevating machine operation is entirely returned to power supply side. Thus, energy saving during regenerative operation is possible. As the current waveform is sinusoidal during regenerative operation, no troubles are caused to the power supply system.

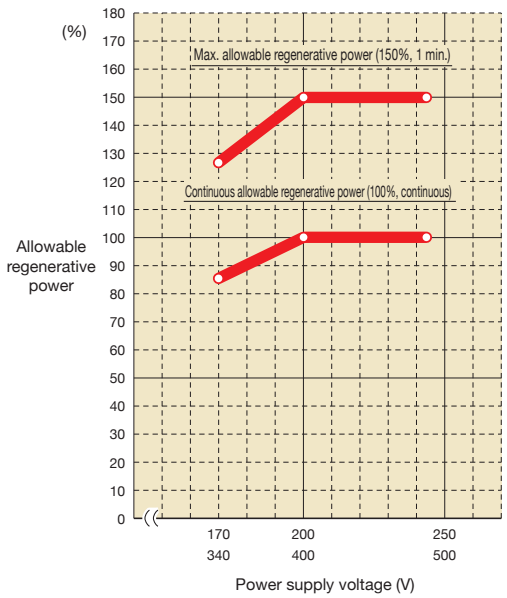
Rated continuous regeneration :	100%
Rated regeneration for 1 min	150% MD (CT) spec.
	120% LD (VT) spec.
	*Stack type: 110%

Comparison of input current waveform

<Without PWM converter> <With PWM converter>



Allowable characteristics of the RHC unit



■ Enhanced maintenance/protective functions

Failure can be easily analyzed with the trace back (option).

①The past 10 alarms can be displayed with the keypad LED display. This helps you analyze the alarm causes and take countermeasures.

②When momentary power failure occurs, the converter turns off the gates to enable continuous operation after recovery.

③The converter can issue warning signals like overload, heat sink overheating, or the end of service life prior to converter tripping.

■ Enhanced network support

•The converter can be connected to MICREX-SX, F series and CC-Link master devices (using option). The RS-485 interface is provided as standard.

Options

Standard Specifications : MD (CT) specifications of medium overload, light overload LD (VT) specifications (Unit and Stack Type)

■ 200V series

Item			Standard Specifications										
Type RHC□□□-2C			7.5	11	15	18.5	22	30	37	45	55	75	90
MD(CT) Specifications	Applicable inverter capacity [kW]		7.5	11	15	18.5	22	30	37	45	55	75	90
	Output	Continuous capacity [kW]	8.8	13	18	22	26	36	44	53	65	88	103
		Overload rating	150% of rated current for 1 min.										
		Voltage 200V	DC320 to 355V (Variable with input power supply voltage) (*3)										
	Required power supply capacity [kVA]		9.5	14	19	24	29	38	47	57	70	93	111
	Carrier frequency		Standard 15kHz									Standard 10kHz	
LD(VT) Specifications	Applicable inverter capacity [kW]		11	15	18.5	22	30	37	45	55	75	90	110
	Output	Continuous capacity [kW]	13	18	22	26	36	44	53	65	88	103	126
		Overload rating	120% of rated current for 1 min.										
		Voltage 200V	DC320 to 355V (Variable with input power supply voltage) (*3)										
	Required power supply capacity [kVA]		14	19	24	29	38	47	57	70	93	111	136
	Carrier frequency		Standard 10kHz									Standard 6kHz	
Power supply voltage	Number of phase/Voltage/Frequency		3-phase 3-wire, 200 to 220V 50Hz,220 to 230V 50Hz(*1), 200 to 230V 60Hz										
	Voltage/Frequency variation		Voltage+10 to -15% Frequency ± 5%, Voltage unbalance: 2% or less (*4)										

■ 400V series

Item			Standard Specifications																							
Type RHC□□□△-4◇○ (*5)			7.5	11	15	18.5	22	30	37	45	55	75	90	110	132	160	200	220	280	315	355	400	500	630	710	800
MD(CT) Specifications	Applicable inverter capacity [kW]		7.5	11	15	18.5	22	30	37	45	55	75	90	110	132	160	200	220	280	315	355	400	500	630	710	800
	Output	Continuous capacity [kW]	8.8	13	18	22	26	36	44	53	65	88	103	126	150	182	227	247	314	353	400	448	560	705	795	896
		Overload rating	150% of rated current for 1 min.																							
		Voltage 200V	DC640 to 710V (Variable with input power supply voltage) (*3)																							
	Required power supply capacity [kVA]		9.5	14	19	24	29	38	47	57	70	93	111	136	161	196	244	267	341	383	433	488	610	762	858	967
	Carrier frequency(*6)		Standard 15kHz									Standard 10kHz			Standard 5kHz											
LD(VT) Specifications	Applicable inverter capacity [kW]		11	15	18.5	22	30	37	45	55	75	90	110	132	160	200	220	280	315	355	400	500		710	800	1000
	Output	Continuous capacity [kW]	13	18	22	26	36	44	53	65	88	103	126	150	182	227	247	314	353	400	448	560		795	896	1120
		Overload rating	120% of rated current for 1 min.(*7)																							
		Voltage 200V	DC640 to 710V (Variable with input power supply voltage) (*3)																							
	Required power supply capacity [kVA]		14	19	24	29	38	47	57	70	93	111	136	161	196	244	267	341	383	433	488	610		858	967	1210
	Carrier frequency(*6)		Standard 10kHz									Standard 6kHz														
Power supply voltage	Number of phase/Voltage/Frequency		3-phase 3-wire, 380 to 440V 50Hz,380 to 460V 60Hz(*2)																							
	Voltage/Frequency variation		Voltage+10 to -15% Frequency ± 5%, Voltage unbalance: 2% or less (*4)																							

(*1) 220 to 230V / 50Hz model available on request.
(*2) The tap in the converter must be switched when the power supply voltage is 380 to 398V / 50Hz or 380 to 430V / 60Hz. The capacity must be reduced when the power supply voltage is less than 400V.
(*3) The output voltage is 320 / 640V DC, 343 / 686V DC, 355 / 710V DC when the power supply voltage is 200 / 400V, 220 / 440V and 230 / 460V, respectively.
(*4) Voltage unbalance [%] = (Max. voltage [V] - Min. voltage [V])/Three-phase average voltage [V] × 67
(*5) Unit type: 7.5 to 630kW, Stack type: 132 to 315 and 630 to 800kW
(*6) Always 5kHz for the stack type.
(*7) Stack type: 110% of constant rating for 1 minute

Common specifications (Unit and Stack Type)

Item		Specifications	
		Unit Type	Stack Type
control	Control method	AVR constant control with ACR minor loop.	
	Running and operation	Rectification starts with power ON after connected. Boosting starts with the running signal (RUN-CM short-circuit or running command from communications). Then, preparation for operation is completed.	
	Running status signal	Running, driving, regenerating, operation ready, alarm relay output (for any fault), etc.	
	MD(CT)/LD(VT) switching	Selecting from MD (CT): Overload rating 150% (1 min.) and LD (VT): Overload rating 120% (1 min.)	Selecting from MD (CT): Overload rating 150% (1 min.) and LD (VT): Overload rating 110% (1 min.)
	Carrier frequency	Fixed to high carrier frequency	5kHz
	Input power factor	Above 0.99 (when 100% loading)	
	Input harmonics current	According to the guideline for suppressing harmonics issued by the Ministry of Economy, Trade and Industry, the converter factor (Ki) can be set to 0.	
	Restart mode after momentary power failure	Stops the gates when the voltage level reaches undervoltage level if momentary power failure occurs, and the converter can automatically restart after the power recovers.	
	Power limit control	Controls the power not to exceed the preset limit value.	
Displays of Keypad	Alarm display (protective functions)	AC fuse blown, AC overvoltage, AC undervoltage, AC overcurrent, AC input current error, Input phase loss, Synchronous power supply frequency error, DC fuse blown, DC overvoltage, DC undervoltage, Charge circuit error, Heat sink overheat, External alarm, Converter overheat, Overload, Memory error, Keypad communication error, CPU error, Network device error, Operation procedure error, A/D converter error, Optical network error, IPM error (*1)	
	Alarm history	Records and displays the last 10 alarms. The detailed information of the trip cause for the latest alarm is stored and displayed.	
	Monitor	Displays input power, input effective current, input effective voltage, DC intermediate current and power supply frequency.	
	Load factor	The load rate can be measured by using the keypad.	
	Display language	Text can displayed in 3 languages: Japanese, English and Chinese.	
	Charge LED	Lights when the main circuit capacitor is charged.	

(*1) Not available in the stack type

[Terminal Functions] [Communications Specifications], [Function Settings], [Protective Functions], [Structure and environment]

Terminal Functions

Category	Terminal signal	Terminal name	Specifications	
			Unit Type	Stack Type
Main circuit	L1/R, L2/S, L3/T	Main Power input	Connects with a 3-phase power supply via the dedicated reactor.	
	P(+), N(–)	Converter output	Connects with the inverter power supply input terminal P (+), N (-).	
	E(G)	Grounding	Ground terminal for inverter chassis (housing).	
	R0, T0	Auxiliary control power supply input	Connects with the same power circuit as that for the control power backup terminal and the main power circuit.	
Voltage detection	R1, S1, T1	Synchronous power supply input for voltage detection	Voltage detection terminals used for the internal converter control. These are connected with the power supply side of the dedicated reactor and filter.	
	R2, T2	Control monitor input	Terminals that connect with the circuit for detecting disconnection caused by blown AC fuse.	
Input signal	RUN	RUN command	The converter starts running when this command is ON between RUN and CM, and stops when OFF.	
	RST	Alarm reset command	In case of alarm stop, eliminate the cause and activate this input by closing the circuit between RST and CM. The protective function is disabled and the alarm state is released.	
	X1	General-purpose transistor input	0: External fault [THR], 1: Current limit cancel [LMT-CCL], 2: 73 answerback [73ANS], 3: Current limit switching [1-LIM], 4: Optional DI [OPY-DI]	
	CM	Digital input common	Common terminal to digital input signals.	
	DCF1,DCF2	DC fuse blow-out detection input	–	When a DC fuse is connected to the converter output, a microswitch for detecting blow-out of the DC fuse is connected to this terminal. This terminal corresponds to the "b" contact output. DC 24V 12mA Typ
	PLC	PLC signal power	Connects with the PLC output signal power supply. (Rated voltage: 24V (22 to 27V) DC)	
Output signal	30A, 30B, 30C	Alarm relay output (for any fault)	Outputs a signal when a protective function is activated to stop the converter. (Contact at 1C, Circuit between 30A and 30C comes ON when an alarm occurs) (Contact capacity: 250V AC, max 50mA.)	
	Y1, Y2, Y3, Y11 to Y18	General-purpose transistor output	0: Inverter running [RUN] 1: Operation ready output [RDY] 2: Power supply current limiting [IL] 3: Lifetime alarm [LIFE] 4: Cooling fin overload [PRE-OH] 5: Overload alarm [PRE-OL] 6: Driving [DRV] 7: Regenerating [REG] 8: Current limit alarm [CUR]9: Under restart [U-RES] 10: Power supply frequency synchronizing [SY-HZ] 11: Alarm indication [AL1]12: Alarm indication 2 [AL2] 13: Alarm indication 4 [AL4] 14: Optional DO [OPT-DO] * With OPC-VG7-DIO option, 8-point expanded functions become available (DI function is not available.)	
	CME	Digital output common		
	Y5A, Y5C	Relay output		
	A01, A04, A05	General-purpose analog output	0: Input power [PWR] 1: Input current rms [I-AC] 2: Input voltage rms [V-AC] 3: DC link circuit voltage [V-DC] 4: Power supply frequency [FREQ] 5: + 10V output test [P10] - 10V output test [N10] * With OPC-VG7-AIO option, 2-point expanded functions become available (Ai function is not usable.)	
	M	Analog output common	Common terminal to analog output signals.	
	73A, 73C	Charging circuit relay output	Control output for the input relay of the external charging resistor (73)	

Communication specification

Item			Specifications	
			Unit Type	Stack Type
Communication Specification	General specifications for communication		Enables to show running information and running status, and to monitor the function code (polling), and to control (selecting) RUN, RST, and X1. * No function code can be written.	
	RS-485		Communicates with the PC or PLC (Fuji protocol and modbus RTU are supported).	
	T-Link (option card)		OPC-VG7-TL option allows T-Link communication with the T-Link module in the MICREX-F or MICREX-SX.	
	SX bus (option card)		OPC-VG7-SX option allows connection with MICREX-SX via SX bus.	
	CC-Link (option card)		OPC-VG7-CCL option allows connection with the CC-Link master device.	
	Trace back (optional)	Hardware	OPC-RHC-TR option allows trace-back of the converter operation status data. The software (WPS-LD-TR) is required.	
		Software	WPS-RHC-TR software allows collecting the trace back data on the PC.	
	Optical communications (optional)		OPC-VG7-SI option allows sharing the load by connecting in parallel 2 or more converters. Therefore, a capacity of up to 2400kW can be supported.	

Function Settings

Function code	Name	
	Unit Type	Stack Type
F00	Data protection	
F01	High-frequency filter selection	
F02	Restart mode after momentary power failure (operation selection)	
F03	Current rating switching	
F04	LED monitor (Display selection)	
F05	LCD monitor (Display selection)	
F06	LCD monitor (Language selection)	
F07	LCD monitor (Contrast adjusting)	
F08	Carrier frequency	
E01	X1 function selection	
E02 to 13	Y1,Y2,Y3,Y5, Y11 to 18 function selection	
E14	I/O function normally open/normally closed	
E15	RHC overload early warning level	
E16	Cooling fan ON-OFF control	
E17	Output while limiting the current (hysteresis width)	
E18 to 20	A01, A04, A05 function selection	
E21 to 23	A01, A04, A05 gain setting	
E24 to 26	A01, A04, A05 bias setting	
E27	A01 to 5 filter setting	
S01	Operation method	
S02,03	Power supply current limit (drive/ control)	
H01	Station address	
H02	Communication error processing selection	
H03	Timer operation time	
H04	Baud rate	
H05	Data length selection	
H06	Parity bit selection	
H07	Stop bit selection	
H08	No-response error detection time	
H09	Response interval time	
H10	Protocol selection	
H11	TL transmission format	
H12	Parallel system	
H13	Number of slave stations in parallel system	
H14	Alarm data deletion	
H15,16	Power supply current limit (drive 1/2)	
H17,18	Power supply current limit (control 1/2)	
H19,20	Current limit early warning (level/ timer)	
M09	Power supply frequency	
M10	Input power	
M11	Effective input current	
M12	Effective input voltage	
M13	Run command	
M14	Running status	
M15	Output terminals Y1 to Y18	

Protective Functions

Item	Displays	Protection Specifications		Remarks
		Unit Type	Stack Type	
AC fuse blown	ACF	When the AC fuse is blown (only R and T phases), the converter stops running.		
AC overvoltage	AOV	The converter stops running on detection of AC overvoltage.		
AC undervoltage	ALV	The converter stops running on detection of AC undervoltage.		
AC overcurrent	AOC	The converter stops running if the input current peak value exceeds the overcurrent level.		
AC input current error	ACE	The converter stops running on detection of excessive deviation between AC input and ACR.		
Input phase loss	LPV	The converter stops running if the input phase loss occurs in the power supply.		
Synchronous power supply frequency error	FrE	The power supply frequency is checked after 73 is input. If a frequency error is detected, the converter stops running. Error during converter running (such as momentary power failure) triggers no alarm.		
DC fuse blown	dCF	The converter stops running if the DC fuse is blown (P side).		Above 18.5kW
DC overvoltage	dOV	The converter stops running on detection of DC overvoltage. If the power failure takes long and the control power goes out, the converter is automatically reset.		200V series: Above 400V ± 3V 400V series: Above 800V ± 5V
DC undervoltage	dLV	The converter stops running on detection of DC undervoltage. If the power failure takes long and the control power goes out, the converter is automatically reset.		200V series: Goes off at 185V and restarts at 208V 400V series: Goes off at 371V and restarts at 417V
Charge circuit error	PbF	When the charge circuit error is detected by using the 73 answerback signal configured in the digital input X1, the converter stops running.		Condition: X1 "73 Answerback" is selected.
Cooling fin overheat	OH1	The converter stops running if the cooling fin overheat is detected.		
External alarm	OH2	The converter stops running if an external signal (THR) is input.		Condition: X1 "External alarm" is selected.
Converter internal overheat	OH3	When overheat is detected in the inverter, the converter stops running.		
Converter overload	OLU	When the output current exceeds the overload characteristic of the inverse time characteristic, the converter stops running.		Start point: 105%, 150% 1 minute
Memory error	Er1	When a fault such as "write error" occurs in the memory (checksum values in EEPROM and RAM do not match), the converter stops running.		
Keypad communication error	Er2	Activated if an error is detected during initial communication. The converter continues operating.		
CPU error	Er3	Activated if an error is detected in the CPU.		
Network device error	Er4	The converter stops running if a fatal error is detected in the master network device (including unconnected power supply).		Applicable to T-Link, SX and CC-Link
Operation procedure error	Er6	When an error is detected in operation procedure, the converter stops running.		
A/D converter error	Er8	When an error is detected in the A/D converter circuit, the converter stops running.		
Optical network error	Erb	The converter stops running if the optical cable is disconnected or a fatal error is detected in an optical device (optional)		
IPM error	IPE	Activated if IPM self-shutoff function is triggered by excessive current or overheat.	–	Less than 15kW

Structure and environment

Item		Structure, environment and standard		Remarks
		Unit Type	Stack Type	
Structure Specifications	Structure	Installed in the panel and cooled by external device		
	Protective structure	IP00		
	Cooling system	Forced air cooling		
	Installation method	Vertical installation		
	Painting Color	Munsell 5Y3/0.5 half-burnished		
	Maintainability	Structure designed for easy parts change		
Environment	Location	• Indoor (location free from corrosive gas, flammable gas, dust and oil mist) (Pollution level 2: IEC 60664-1) • No direct sunlight.		
	Ambient temperature	-10 to 50°C	-10 to +40°C	
	Humidity	5 to 95% RH Without condensing		
	Altitude	Less than 3000m (output reduction may occur if the altitude is in the range between 1001 and 3000m)	Less than 3000m However, the output may be reduced at the altitude of 1001 to 3000m For use at the altitude of 2001 to 3000m, the insulation class of the control circuit is changed from "Enhanced insulation" to "Basic insulation."	
	Vibration	2 to 9Hz: Amplitude=3mm, 9 to 20Hz: 9.8m / s^2, 20 to 55Hz: 2m / s^2 (9 to 55Hz: 2 m / s^2 is used if the power is higher than 90kW.)	Amplitude = 0.3mm, 2 to 9Hz: 1m / s^2:9 to 200Hz	
	Storage temperature	-20 to 55°C	-25 to 70°C (-10 to +30°C for long-term storage)	
	Storage humidity	5 to 95%RH		

Options

Equipment Configuration List

MD(CT) Specifications

Power Supply Voltage	Nominal applied motor [kW]	PWM converter Type	Charging circuit contactor		Contactor for power source		Charging circuit box (*1)						Boosting reactor		Resistor for filter		Reactor for filter		Capacitor for filter		Filtering circuit contactor	
								Charging resistor		AC Fuse												
			(73)	Q'ty	(52)	Q'ty	(CU)	Q'ty	(R0)	Q'ty	(Fac)	Q'ty	(Lr)	Q'ty	(Rf)	Q'ty	(Lf)	Q'ty	(Cf)	Q'ty	(6F)	Q'ty
3-phase 200V	7.5	RHC7.5-2C	SC-5-1	1			CU7.5-2C	1	(80W 7.5Ω)	(3)	(CR2LS-50/UL)	(2)	LR2-7.5C	1	GRZG80 0.42Ω	3	LFC2-7.5C	1	CF2-7.5C	1		
	11	RHC11-2C	SC-N1	1			CU11-2C	1	(HF5C5504)		(CR2LS-75/UL)	(2)	LR2-15C	1	GRZG150 0.2Ω	3	LFC2-15C	1	CF2-15C	1		
	15	RHC15-2C	SC-N2	1			CU15-2C	1			(CR2LS-100/UL)	(2)										
	18.5	RHC18.5-2C	SC-N3	1			CU18.5-2C	1	(GRZG120 2Ω)	(3)			LR2-22C	1	GRZG200 0.13Ω	3	LFC2-22C	1	CF2-22C	1		
	22	RHC22-2C					CU22-2C	1			(CR2L-150/UL)	(2)										
	30	RHC30-2C	SC-N4	1			CU30-2C	1			(CR2L-200/UL)	(2)	LR2-37C	1	GRZG400 0.1Ω	3	LFC2-37C	1	CF2-37C	1		
	37	RHC37-2C	SC-N5	1			CU45-2C	1			(CR2L-260/UL)	(2)										
	45	RHC45-2C	SC-N7	1									LR2-55C	1			LFC2-55C	1	CF2-55C	1		
	55	RHC55-2C	SC-N8	1			CU55-2C	1			(CR2L-400/UL)	(2)										
	75	RHC75-2C	SC-N11	1			CU75-2C	1					LR2-75C	1			LFC2-75C	1	CF2-75C	1		
	90	RHC90-2C					CU90-2C	1	(GRZG400 1Ω)	(3)	(A50P600-4)	(2)	LR2-110C	1	GRZG400 0.12Ω [2 parallel]	6	LFC2-110C	1	CF2-110C	1		
3-phase 400V	7.5	RHC7.5-4C	SC-05	1			CU7.5-4C	1	(TK50B 30ΩJ)	(3)	(CR6L-30/UL)	(2)	LR4-7.5C	1	GRZG80 1.74Ω	3	LFC4-7.5C	1	CF4-7.5C	1		
	11	RHC11-4C	SC-4-0	1			CU15-4C	1	(HF5B0416)		(CR6L-50/UL)	(2)	LR4-15C	1	GRZG150 0.79Ω	3	LFC4-15C	1	CF4-15C	1		
	15	RHC15-4C	SC-5-1	1																		
	18.5	RHC18.5-4C	SC-N1	1			CU18.5-4C	1	(80W 7.5Ω)	(3)			LR4-22C	1	GRZG200 0.53Ω	3	LFC4-22C	1	CF4-22C	1		
	22	RHC22-4C					CU22-4C	1	(HF5C5504)		(CR6L-75/UL)	(2)										
	30	RHC30-4C	SC-N2	1			CU30-4C	1			(CR6L-100/UL)	(2)	LR4-37C	1	GRZG400 0.38Ω	3	LFC4-37C	1	CF4-37C	1		
	37	RHC37-4C	SC-N2S	1			CU45-4C	1			(CR6L-150/UL)	(2)										
	45	RHC45-4C	SC-N3	1									LR4-55C	1	GRZG400 0.26Ω	3	LFC4-55C	1	CF4-55C	1		
	55	RHC55-4C	SC-N4	1			CU55-4C	1			(CR6L-200/UL)	(2)										
	75	RHC75-4C	SC-N5	1			CU75-4C	1					LR4-75C	1	GRZG400 0.38Ω	3	LFC4-75C	1	CF4-75C	1		
	90	RHC90-4C	SC-N7	1			CU90-4C	1			(CR6L-300/UL)	(2)	LR4-110C	1	GRZG400 0.53Ω [2 parallel]	6	LFC4-110C	1	CF4-110C	1		
	110	RHC110-4C	SC-N8	1			CU110-4C	1	(GRZG120 2Ω)	(3)												
	132	RHC132○-4△□					CU132-4C	1			(A50P400-4)	(2)	LR4-160C	1	RF4-160C	1	LFC4-160C	1	CF4-160C	1		
	160	RHC160○-4△□	SC-N11	1			CU160-4C	1			(A50P600-4)	(2)										
	200	RHC200○-4△□	SC-N12	1			CU200-4C	1	(GRZG400 1Ω)	(3)			LR4-220C	1	RF4-220C	1	LFC4-220C	1	CF4-220C	1		
	220	RHC220○-4△□					CU220-4C	1			(A70QS800-4)	(2)										
	280	RHC280○-4△□	SC-N3	1	SC-N14	1			GRZG400 1Ω	6	A70QS800-4	2	LR4-280C	1	RF4-280C	1	LFC4-280C	1	CF4-280C	1	SC-N4/SF	1
	315	RHC315○-4△□							[2 parallel]		A70P1600-4TA	2	LR4-315C	1	RF4-315C	1	LFC4-315C	1	CF4-315C	1		
	355	RHC355-4C											LR4-355C	1	RF4-355C	1	LFC4-355C	1	CF4-355C	1		
	400	RHC400-4C			SC-N16	1							LR4-400C	1	RF4-400C	1	LFC4-400C	1	CF4-400C	1		
	500	RHC500-4C			SC-N11	3							LR4-500C	1	RF4-500C	1	LFC4-500C	1(*2)	CF4-500C	1(*2)		
	630	RHC630○-4△□			SC-N12	3					A70P2000-4(*3)	2	LR4-630C	1	RF4-630C	1	LFC4-630C	1(*2)	CF4-630C	1(*2)	SC-N7	1
	710	RHC710B-4△□	SC-N4	1							HF5G2655	2	LR4-710C	1	RF4-710C	1	LFC4-710C	1(*2)	CF4-710C	1(*2)	SC-N8	1
	800	RHC800B-4△□			SC-N14	3							LR4-800C	1	RF4-800C	1	LFC4-800C	1	CF4-800C	1(*2)		

LD (CT) Specifications

Power Supply Voltage	Nominal applied motor [kW]	PWM converter Type	Charging circuit contactor		Contactor for power source		Charging circuit box (*1)						Boosting reactor		Resistor for filter		Reactor for filter		Capacitor for filter		Filtering circuit contactor	
								Charging resistor		AC Fuse												
			(73)	Q'ty	(52)	Q'ty	(CU)	Q'ty	(R0)	Q'ty	(Fac)	Q'ty	(Lr)	Q'ty	(Rf)	Q'ty	(Lf)	Q'ty	(Cf)	Q'ty	(6F)	Q'ty
3-phase 200V	11	RHC7.5-2C	SC-N1	1			CU7.5-2C	1	(80W 7.5Ω)	(3)	(CR2LS-50/UL)	(2)	LR2-15C	1	GRZG150 0.2Ω	3	LFC2-15C	1	CF2-15C	1		
	15	RHC11-2C	SC-N2	1			CU11-2C	1	(HF5C5504)		(CR2LS-75/UL)	(2)										
	18.5	RHC15-2C	SC-N3	1			CU15-2C	1			(CR2LS-100/UL)	(2)	LR2-22C	1	GRZG200 0.13Ω	3	LFC2-22C	1	CF2-22C	1		
	22	RHC18.5-2C					CU18.5-2C	1	(GRZG120 2Ω)	(3)												
	30	RHC22-2C	SC-N4	1			CU22-2C	1			(CR2L-150/UL)	(2)	LR2-37C	1	GRZG400 0.1Ω	3	LFC2-37C	1	CF2-37C	1		
	37	RHC30-2C	SC-N5	1			CU30-2C	1			(CR2L-200/UL)	(2)										
	45	RHC37-2C	SC-N7	1			CU45-2C	1			(CR2L-260/UL)	(2)	LR2-55C	1			LFC2-55C	1	CF2-55C	1		
	55	RHC45-2C	SC-N8	1																		
	75	RHC55-2C	SC-N11	1			CU55-2C	1			(CR2L-400/UL)	(2)	LR2-75C	1			LFC2-75C	1	CF2-75C	1		
	90	RHC75-2C					CU75-2C	1					LR2-110C	1	GRZG400 0.12Ω [2 parallel]	6	LFC2-110C	1	CF2-110C	1		
	110	RHC90-2C	SC-N12	1			CU90-2C	1	(GRZG400 1Ω)	(3)	(A50P600-4)	(2)										
3-phase 400V	11	RHC7.5-4C	SC-4-0	1			CU7.5-4C	1	(TK50B 30ΩJ)	(3)	(CR6L-30/UL)	(2)	LR4-15C	1	GRZG150 0.79Ω	3	LFC4-15C	1	CF4-15C	1		
	15	RHC11-4C	SC-5-1	1			CU15-4C	1	(HF5B0416)		(CR6L-50/UL)	(2)										
	18.5	RHC15-4C	SC-N1	1									LR4-22C	1	GRZG200 0.53Ω	3	LFC4-22C	1	CF4-22C	1		
	22	RHC18.5-4C					CU18.5-4C	1	(80W 7.5Ω)	(3)												
	30	RHC22-4C	SC-N2	1			CU22-4C	1	(HF5C5504)		(CR6L-75/UL)	(2)	LR4-37C	1	GRZG400 0.38Ω	3	LFC4-37C	1	CF4-37C	1		
	37	RHC30-4C	SC-N2S	1			CU30-4C	1			(CR6L-100/UL)	(2)										
	45	RHC37-4C	SC-N3	1			CU45-4C	1			(CR6L-150/UL)	(2)	LR4-55C	1	GRZG400 0.26Ω	3	LFC4-55C	1	CF4-55C	1		
	55	RHC45-4C	SC-N4	1																		
	75	RHC55-4C	SC-N5	1			CU55-4C	1			(CR6L-200/UL)	(2)	LR4-75C	1	GRZG400 0.38Ω	3	LFC4-75C	1	CF4-75C	1		
	90	RHC75-4C	SC-N7	1			CU75-4C	1					LR4-110C	1	GRZG400 0.53Ω [2 parallel]	6	LFC4-110C	1	CF4-110C	1		
	110	RHC90-4C	SC-N8	1			CU90-4C	1			(CR6L-300/UL)	(2)										
	132	RHC110○-4△□					CU110-4C	1	(GRZG120 2Ω)	(3)			LR4-160C	1	RF4-160C	1	LFC4-160C	1	CF4-160C	1		
	160	RHC132○-4△□	SC-N11	1			CU132-4C	1			(A50P400-4)	(2)										
	200	RHC160○-4△□	SC-N12	1			CU160-4C	1			(A50P600-4)	(2)	LR4-220C	1	RF4-220C	1	LFC4-220C	1	CF4-220C	1		
	220	RHC200○-4△□					CU200-4C	1	(GRZG400 1Ω)	(3)												
	280	RHC220○-4△□	SC-N14	1			CU220-4C	1	(GRZG400 1Ω)	(3)	(A70QS800-4)	(2)	LR4-280C	1	RF4-280C	1	LFC4-280C	1	CF4-280C	1		
	315	RHC280○-4△□	SC-N3	1	SC-N14	1			GRZG400 1Ω	6	A70QS800-4	2	LR4-315C	1	RF4-315C	1	LFC4-315C	1	CF4-315C	1	SC-N4/SF	1
	355	RHC315○-4△□							[2 parallel]		A70P1600-4TA	2	LR4-355C	1	RF4-355C	1	LFC4-355C	1	CF4-355C	1		
	400	RHC355-4C			SC-N16	1							LR4-400C	1	RF4-400C	1	LFC4-400C	1	CF4-400C	1		
	500	RHC400-4C			SC-N11	3							LR4-500C	1	RF4-500C	1	LFC4-500C	1(*2)	CF4-500C	1(*2)		
	710	RHC630B-4△□			SC-N12	3					HF5G2655	2	LR4-710C	1	RF4-710C	1	LFC4-710C	1(*2)	CF4-710C	1(*2)		
	800	RHC710B-4△□			SC-N14	3						2	LR4-800C	1	RF4-800C	1	LFC4-800C	1	CF4-800C	1(*2)		
	1000	RHC800B-4△□	Contact Fuji.																			

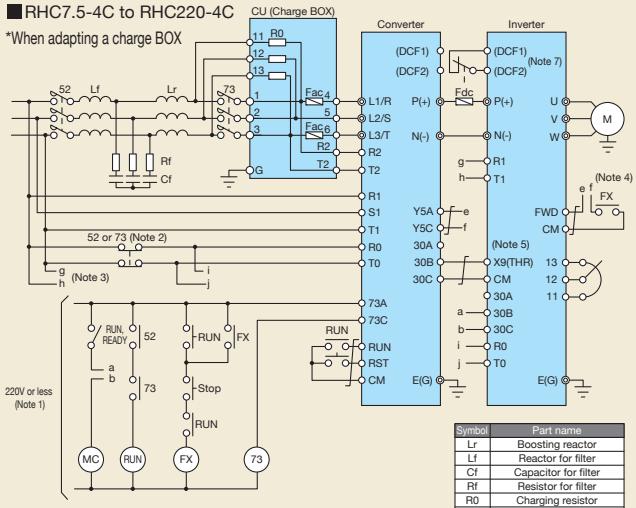
(*1) The charging resistor (R0) and AC fuse (Fac) have been built inside the charging circuit box (CU). When the charging circuit box (CU) is not ordered, the charging resistor (R0) and fuse (Fac) must be ordered separately.
(*2) The filter capacitor consists of two capacitors. A pair of capacitors is shipped by ordering "1" pc.
(*3) The "SA598473" will be used for the stack type inverter.

Basic Wiring Diagram

<Unit Type>
■ RHC7.5-2C to RHC90-2C
■ RHC7.5-4C to RHC220-4C

<Stack Type>
■ RHC132S-4D△ to RHC220S-4D△

*When adapting a charge BOX

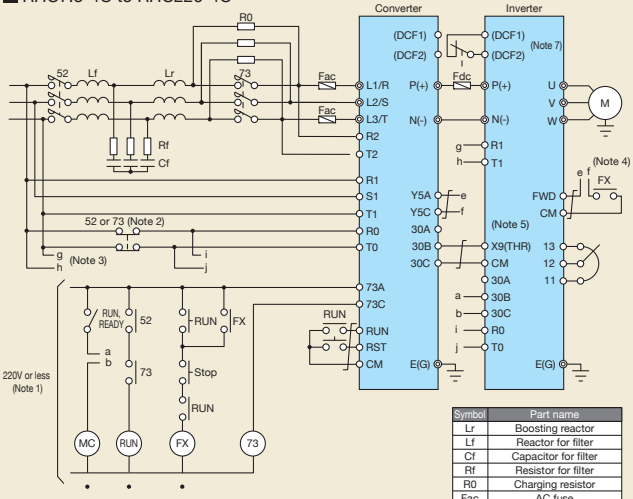


Symbol	Part name
Lr	Boosting reactor
Lf	Reactor for filter
Cf	Capacitor for filter
Rf	Resistor for filter
R0	Charging resistor
Fac	AC fuse
Fdc	DC fuse
73	Electromagnetic contactor for charge circuit
52	Electromagnetic contactor for power supply

(Note 1) If the main power supply is 400V series, connect a step-down transformer to limit the voltage of the sequence circuit lower than 220V.
(Note 2) The auxiliary power supply input terminals for the PWM converter (R0, T0) must be connected to the main power supply via the contact" b" of the charging circuit electromagnetic contactor (73 or 52). When applying ungrounded power supply, ground transformer must be set.
(Note 3) Make sure to connect the auxiliary power supply input terminals of the inverter (R0,T0) to the main power supply via the contact "b" of the charging circuit electromagnetic contactor (73 or 52). For the capacities FRN37VG1S-2□and FRN75VG1S-4□or higher and stack type inverter (all capacity range), connect the inverter fan power auxiliary input terminals (R1,T1) to the main power supply without passing through the contact "b" of 73 or 52.
(Note 4) Use the sequence that the run command signal is input in the inverter after the PWM converter becomes ready.
(Note 5) One of terminals (X1 to X9) on the inverter unit must be set to external alarm (THR).
(Note 6) Be sure to connect the L1/R, L2/S, L3/T, R2, T2, R1, S1, and T1 terminals keeping the phase sequence.
(Note 7) Not available in the unit type inverter.

<Unit Type>
■ RHC7.5-2C to RHC90-2C
■ RHC7.5-4C to RHC220-4C

<Stack Type>
■ RHC132S-4D△ to RHC220S-4D△

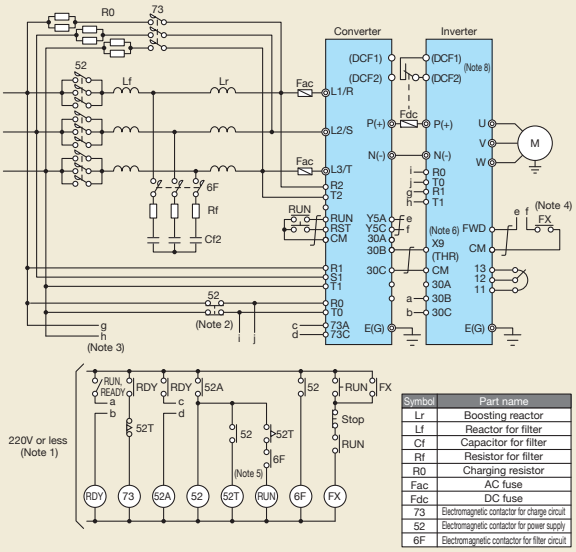


Symbol	Part name
Lr	Boosting reactor
Lf	Reactor for filter
Cf	Capacitor for filter
Rf	Resistor for filter
R0	Charging resistor
Fac	AC fuse
Fdc	DC fuse
73	Electromagnetic contactor for charge circuit
52	Electromagnetic contactor for power supply

(Note 1) If the main power supply is 400V series, connect a step-down transformer to limit the voltage of the sequence circuit lower than 220V.
(Note 2) The auxiliary power supply input terminals for the PWM converter (R0, T0) must be connected to the main power supply via the contact" b" of the charging circuit electromagnetic contactor (73 or 52). When applying ungrounded power supply, ground transformer must be set.
(Note 3) Make sure to connect the auxiliary power supply input terminals of the inverter (R0,T0) to the main power supply via the contact "b" of the charging circuit electromagnetic contactor (73 or 52). For the capacities FRN37VG1S-2□and FRN75VG1S-4□or higher and stack type inverter (all capacity range), connect the inverter fan power auxiliary input terminals (R1,T1) to the main power supply without passing through the contact "b" of 73 or 52.
(Note 4) Use the sequence that the run command signal is input in the inverter after the PWM converter becomes ready.
(Note 5) One of terminals (X1 to X9) on the inverter unit must be set to external alarm (THR).
(Note 6) Be sure to connect the L1/R, L2/S, L3/T, R2, T2, R1, S1, and T1 terminals keeping the phase sequence.
(Note 7) Not available in the unit type inverter.

<Unit Type>
■ RHC280-4C to RHC400-4C

<Stack Type>
■ RHC280S-4D△ to RHC315S-4D△

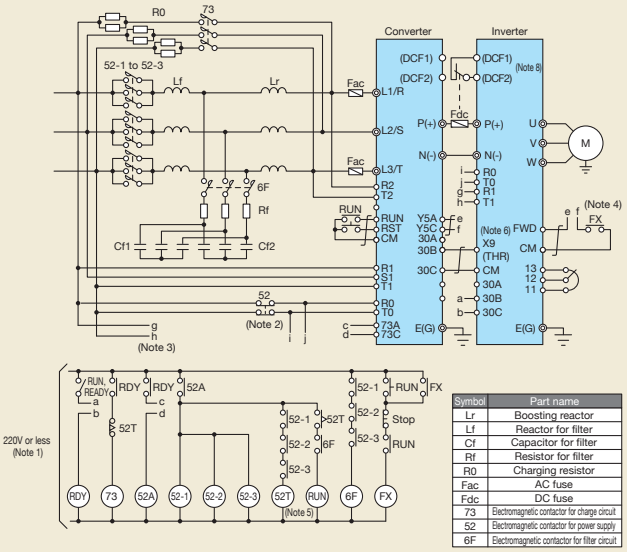


Symbol	Part name
Lr	Boosting reactor
Lf	Reactor for filter
Cf	Capacitor for filter
Rf	Resistor for filter
R0	Charging resistor
Fac	AC fuse
Fdc	DC fuse
73	Electromagnetic contactor for charge circuit
52	Electromagnetic contactor for power supply
6F	Electromagnetic contactor for filter circuit

(Note 1) Connect a step-down transformer to limit the voltage of the sequence circuit lower than 220V.
(Note 2) The auxiliary power supply input terminals for the PWM converter (R0, T0) must be connected to the main power supply via the contact "b" of the charging circuit electromagnetic contactor (52). When applying ungrounded power supply, grounded transformer must be set.
(Note 3) Since the AC fan power supply receives power from R1 and T1 terminals, the power supply must be connected without passing through the contact "b" of 73 or 52.
(Note 4) Use the sequence that the run command signal is input in the inverter after the PWM converter becomes ready.
(Note 5) The 52T timer must be set to 1 sec.
(Note 6) One of terminals (X1 to X9) on the inverter unit must be set to external alarm (THR).
(Note 7) Be sure to connect the L1/R, L2/S, L3/T, R2, T2, R1, S1, and T1 terminals keeping the phase sequence.
(Note 8) Not available in the unit type inverter.

<Unit Type>
■ RHC500-4C to RHC630-4C

<Stack Type>
■ RHC630S-4D△ to RHC800B-4D△



Symbol	Part name
Lr	Boosting reactor
Lf	Reactor for filter
Cf	Capacitor for filter
Rf	Resistor for filter
R0	Charging resistor
Fac	AC fuse
Fdc	DC fuse
73	Electromagnetic contactor for charge circuit
52	Electromagnetic contactor for power supply
6F	Electromagnetic contactor for filter circuit

(Note 1) Connect a step-down transformer to limit the voltage of the sequence circuit lower than 220V.
(Note 2) The auxiliary power supply input terminals for the PWM converter (R0, T0) must be connected to the main power supply via the contact "b" of the charging circuit electromagnetic contactor (52). When applying ungrounded power supply, grounded transformer must be set.
(Note 3) Since the AC fan power supply receives power from R1 and T1 terminals, the power supply must be connected without passing through the contact "b" of 73 or 52.
(Note 4) Use the sequence that the run command signal is input in the inverter after the PWM converter becomes ready.
(Note 5) The 52T timer must be set to 1 sec.
(Note 6) One of terminals (X1 to X9) on the inverter unit must be set to external alarm (THR).
(Note 7) Be sure to connect the L1/R, L2/S, L3/T, R2, T2, R1, S1, and T1 terminals keeping the phase sequence.
(Note 8) Not available in the unit type inverter.

Options

External Dimensions

PWM converter main body (Unit Type)

Fig. A

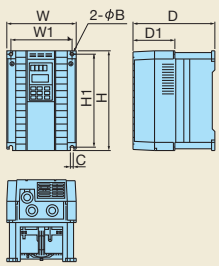


Fig. B

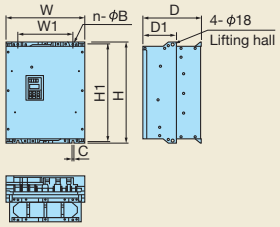


Fig. C

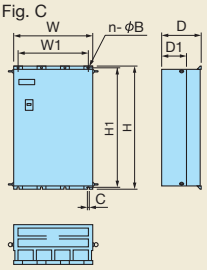
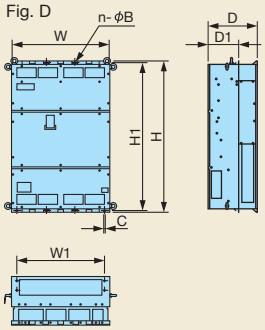


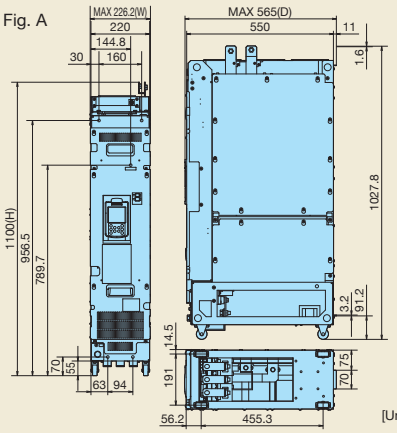
Fig. D



PWM converter Type		Fig	Dimensions [mm]									Approx. weight [kg]
			W	W1	H	H1	D	D1	n	B	C	
200V series	RHC7.5-2C	A	250	226	380	358	245	125	2	10	10	12.5
	RHC11-2C											
	RHC15-2C											
	RHC18.5-2C	B	340	240	480	460	255	145	2	10	10	24
	RHC22-2C											
	RHC30-2C	B	340	240	550	530	255	145	2	10	10	29
	RHC37-2C	B	375	275	615	595	270	145	2	10	10	36
	RHC45-2C	B	375	275	740	720	270	145	2	10	10	42
	RHC55-2C	B	375	275	740	720	270	145	2	10	10	44
	RHC75-2C	C	530	430	750	720	285	145	2	15	15	70
	RHC90-2C	C	680	580	880	850	360	220	3	15	15	115
400V series	RHC7.5-4C	A	250	226	380	358	245	125	2	10	10	12.5
	RHC11-4C											
	RHC15-4C											
	RHC18.5-4C	B	340	240	480	460	255	145	2	10	10	24
	RHC22-4C											
	RHC30-4C	B	340	240	550	530	255	145	2	10	10	29
	RHC37-4C	B	375	275	550	530	270	145	2	10	10	34
	RHC45-4C	B	375	275	675	655	270	145	2	10	10	38
	RHC55-4C	B	375	275	675	655	270	145	2	10	10	39
	RHC75-4C	B	375	275	740	720	270	145	2	10	10	48
	RHC90-4C	C	530	430	740	710	315	175	2	15	15	70
	RHC110-4C											
	RHC132-4C	C	530	430	1000	970	360	220	2	15	15	100
	RHC160-4C											
	RHC200-4C	C	680	580	1000	970	360	220	3	15	15	140
	RHC220-4C											
	RHC280-4C	C	680	580	1400	1370	450	285	3	15	15	320
	RHC315-4C											
	RHC355-4C	C	880	780	1400	1370	450	285	4	15	15	410
	RHC400-4C											
	RHC500-4C	D	999	900	1550	1520	500	313.2	4	15	15	525
	RHC630-4C											

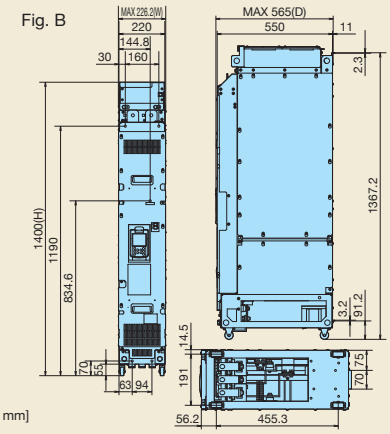
PWM converter main body (Stack Type)

Fig. A



RHC132S-4D□ to RHC200S-4D□

Fig. B



RHC220S-4D□ to RHC315S-4D□

Series	Inverter Type	Fig	Body external [mm]			Approx. weight [kg]
			W	H	D	
400V	RHC132S-4D□	A	226.2	1100	565	85
	RHC160S-4D□	A	226.2	1100	565	85
	RHC200S-4D□	A	226.2	1100	565	85
	RHC220S-4D□	B	226.2	1400	565	126
	RHC280S-4D□	B	226.2	1400	565	126
	RHC315S-4D□	B	226.2	1400	565	126
	RHC630B-4D□ (*1)	–	–	–	–	–
	RHC710B-4D□ (*1)	–	–	–	–	–
	RHC800B-4D□ (*1)	–	–	–	–	–

*1) Each stack corresponds to one phase, and one set of the inverter consists of three stacks.
The touch panel is attached only to the V phase.
For external dimensions, contact Fuji Electric Sales Department.

<Boosting reactor>

Fig. A

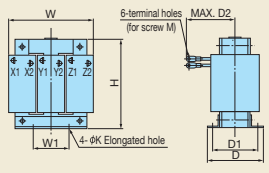


Fig. B

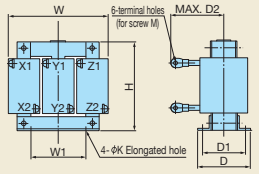


Fig. C

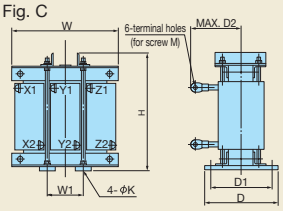
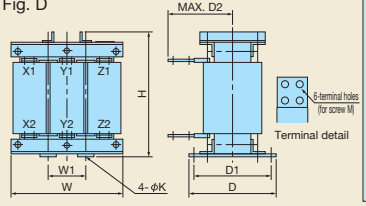


Fig. D



Pressurization reactor Type		Fig	Dimensions [mm]								Approx. weight [kg]
			W	W1	H	D	D1	D2	K	M	
200V series	LR2-7.5C	A	180	75	205	105	85	95	7	M5	12
	LR2-15C	B	195	75	215	131	110	130	7	M8	18
	LR2-22C	C	240	80	340	215	180	145	10	M8	33
	LR2-37C	C	285	95	420	240	205	150	12	M10	50
	LR2-55C	C	285	95	420	250	215	160	12	M12	58
	LR2-75C	C	330	110	440	255	220	165	12	M12	70
	LR2-110C	C	345	115	500	280	245	185	12	M12	100
400V series	LR4-7.5C	B	180	75	205	105	85	90	7	M4	12
	LR4-15C	A	195	75	215	131	110	120	7	M5	18
	LR4-22C	C	240	80	340	215	180	120	10	M6	33
	LR4-37C	C	285	95	405	240	205	130	12	M8	50
	LR4-55C	C	285	95	415	250	215	145	12	M10	58
	LR4-75C	C	330	110	440	255	220	150	12	M10	70
	LR4-110C	C	345	115	490	280	245	170	12	M12	100
	LR4-160C	C	380	125	550	300	260	185	15	M12	140
	LR4-220C	C	450	150	620	330	290	230	15	M12	200
	LR4-280C	C	480	160	740	330	290	240	15	M16	250
	LR4-315C	C	480	160	760	340	300	250	15	M16	270
	LR4-355C	C	480	160	830	355	315	255	15	M16	310
	LR4-400C	C	480	160	890	380	330	260	19	M16	340
	LR4-500C	C	525	175	960	410	360	290	19	M16	420
	LR4-630C	D	600	200	640	440	390	290	19	4×M12	450

Guideline for Suppressing Harmonics

Application to "Guideline for Suppressing Harmonics by the Users Who Receive High Voltage or Special High Voltage"

Our FRENIC series are the products specified in the "Guideline for Suppressing Harmonics by Customers Receiving High Voltage or Special High Voltage." When you enter into a new contract with an electric power company or update a contract, you are requested by the electric power company to submit an accounting statement form.

(1) Scope of regulation

In principle, the guideline applies to the customers that meet the following two conditions:

- The customer receives high voltage or special high voltage.
- The "equivalent capacity" of the converter load exceeds the standard value for the receiving voltage (50kVA at a receiving voltage of 6.6kV).

(2) Regulation method

The level (calculated value) of the harmonic current that flows from the customer's receiving point out to the system is subjected to the regulation. The regulation value is proportional to the contract demand. The regulation values specified in the guideline are shown in Table 1.

Table 1 Upper limits of harmonic outflow current per kW of contract demand [mA/kW]

Receiving voltage	5th	7th	11th	13th	17th	19th	23th	Over 25th
6.6kV	3.5	2.5	1.6	1.3	1.0	0.90	0.76	0.70
22kV	1.8	1.3	0.82	0.69	0.53	0.47	0.39	0.36

1. Calculation of Equivalent Capacity (Pi)

Although the equivalent capacity (Pi) is calculated using the equation of (input rated capacity) x (conversion factor), catalog of conventional inverters do not contain input rated capacities. A description of the input rated capacity is shown below:

(1) "Inverter rated capacity" corresponding to "Pi"

- Calculate the input fundamental current I1 from the kW rating and efficiency of the load motor, as well as the efficiency of the inverter. Then, calculate the input rated capacity as shown below:
  Input rated capacity = $\sqrt{3}$ x (power supply voltage) x I_1 x 1.0228/1000[kVA]
  Where 1.0228 is the 6-pulse converter's value obtained by (effective current) / (fundamental current).
- When a general-purpose motor or inverter motor is used, the appropriate value shown in Table 2 can be used. Select a value based on the kW rating of the motor used, irrespective of the inverter type.

Table 2 "Input rated capacities" of general-purpose inverters determined by the nominal applied motors

Nominal applied motor [kW]		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22
Pi [kVA]	200V	0.57	0.97	1.95	2.81	4.61	6.77	9.07	13.1	17.6	21.8	25.9
	400V	0.57	0.97	1.95	2.81	4.61	6.77	9.07	13.1	17.6	21.8	25.9

Nominal applied motor [kW]		30	37	45	55	75	90	110	132	160	200	220
Pi [kVA]	200V	34.7	42.8	52.1	63.7	87.2	104	127				
	400V	34.7	42.8	52.1	63.7	87.2	104	127	153	183	229	252

Nominal applied motor [kW]		250	280	315	355	400	450	500	530	560	630
Pi [kVA]	200V										
	400V	286	319	359	405	456	512	570	604	638	718

(2) Values of "Ki (conversion factor)"

- Depending on whether an optional ACR (AC REACTOR) or DCR (DC REACTOR) is used, apply the appropriate conversion factor specified in the appendix to the guideline. The values of the converter factor are shown in Table 3.

Table 3 "Conversion factors Ki" for general-purpose inverters determined by reactors

Circuit category	Circuit Type		Conversion factor Ki	Main applications
3	3-phase rectifier (smoothing capacitor)	Without a reactor	K31=3.4	• General-purpose inverters • Elevators • Refrigerators, air conditioning systems • Other general appliances
		With a reactor (ACR)	K32=1.8	
		With a reactor (DCR)	K33=1.8	
		With reactors (ACR and DCR)	K34=1.4	

2. Calculation of Harmonic Current

(1) Value of "input fundamental current"

- Apply the appropriate value shown in Table 4 based on the kW rating of the motor, irrespective of the inverter type or whether a reactor is used.

* If the input voltage is different, calculate the input fundamental current in inverse proportion to the voltage.

Table 4 "Input fundamental currents" of general-purpose inverters determined by the nominal applied motors

Nominal applied motor [kW]		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22
Input fundamental current [A]	200V	1.62	2.74	5.50	7.92	13.0	19.1	25.6	36.9	49.8	61.4	73.1
	400V	0.81	1.37	2.75	3.96	6.50	9.55	12.8	18.5	24.9	30.7	36.6
6.6 kV converted value [mA]		49	83	167	240	394	579	776	1121	1509	1860	2220

Nominal applied motor [kW]		30	37	45	55	75	90	110	132	160	200	220
Input fundamental current [A]	200V	98.0	121	147	180	245	293	357				
	400V	49.0	60.4	73.5	89.9	123	147	179	216	258	323	355
6.6 kV converted value [mA]		2970	3660	4450	5450	7450	8910	10850	13090	15640	19580	21500

Nominal applied motor [kW]		250	280	315	355	400	450	500	530	560	630
Input fundamental current [A]	200V										
	400V	403	450	506	571	643	723	804	852	900	1013
6.6 kV converted value [mA]		24400	27300	30700	34600	39000	43800	48700	51600	54500	61400

(2) Calculation of harmonic current

Table 5 Generated harmonic current [%], 3-phase rectifier (smoothing capacitor)

Degree	5th	7th	11th	13th	17th	19th	23th	25th
Without a reactor	65	41	8.5	7.7	4.3	3.1	2.6	1.8
With a reactor (ACR)	38	14.5	7.4	3.4	3.2	1.9	1.7	1.3
With a reactor (DCR)	30	13	8.4	5.0	4.7	3.2	3.0	2.2
With reactors (ACR and DCR)	28	9.1	7.2	4.1	3.2	2.4	1.6	1.4

- ACR: 3%
- DCR: Accumulated energy equal to 0.08 to 0.15ms (100% load conversion)
- Smoothing capacitor: Accumulated energy equal to 15 to 30ms (100% load conversion)
- Load: 100%

■ nth harmonic current [A] = Fundamental current [A] × $\frac{\text{Generated nth harmonic current [\%]}}{100}$

Calculate the harmonic current of each order (harmonic number) using the following equation:

(3) Maximum availability factor

- For a load like elevators, which provides intermittent operation, or a load with a over-dimensioned motor rating, reduce the current by multiplying the equation by the "maximum availability factor" of the load.
- The "maximum availability factor of an appliance" means the ratio of the capacity of the harmonic generator in operation at which the availability reaches the maximum, to its total capacity, and the capacity of the generator in operation is an average for 30 minutes.
- In general, the maximum availability factor is calculated according to this definition, but the standard values shown in Table 6 are recommended for inverters for building equipment.

Table 6 Availability factors of inverters, etc. for building equipment (standard values)

Equipment type	Inverter capacity category	Single inverter availability factor
Air conditioning system	200kW or less	0.55
	Over 200kW	0.60
Sanitary pump	——	0.30
Elevator	——	0.25
Refrigerator, freezer	50kW or less	0.60
UPS (6-pulse)	200kVA	0.60

[Correction coefficient according to contract demand level]

- Since the total availability factor decreases with increase in the building scale, calculating reduced harmonics with the correction coefficient β defined in Table 7 below is permitted.

Table 7 Correction coefficient according to the building scale

Contract demand [kW]	Correction coefficient β
300	1.00
500	0.90
1000	0.85
2000	0.80

*If the contract demand is between two specified values shown in Table 7, calculate the value by interpolation.

(4) Harmonic order to be calculated

Calculate only the "5th and 7th" harmonic currents

NOTES

When running general-purpose motors

- **Driving a 400V general-purpose motor**
  When driving a 400V general-purpose motor with an inverter using extremely long cables, damage to the insulation of the motor may occur. Use an output circuit filter (OFL) if necessary after checking with the motor manufacturer. Fuji's motors do not require the use of output circuit filters because of their reinforced insulation.
- **Torque characteristics and temperature rise**
  When the inverter is used to run a general-purpose motor, the temperature of the motor becomes higher than when it is operated using a commercial power supply. In the low-speed range, the cooling effect will be weakened, so decrease the output torque of the motor. If constant torque is required in the low-speed range, use a Fuji inverter motor or a motor equipped with an externally powered ventilating fan.
- **Vibration**
  When the motor is mounted to a machine, resonance may be caused by the natural frequencies, including that of the machine. Operation of a 2-pole motor at 60Hz or more may cause abnormal vibration.
  * Study use of tier coupling or dampening rubber.
  * It is also recommended to use the inverter jump frequencies control to avoid resonance points.
- **Noise**
  When an inverter is used with a general-purpose motor, the motor noise level is higher than that with a commercial power supply. To reduce noise, raise carrier frequency of the inverter. High-speed operation at 60Hz or more can also result in more noise.

When running special motors

- **Explosion-proof motors**
  When driving an explosion-proof motor with an inverter, use a combination of a motor and an inverter that has been approved in advance.
- **Brake motors**
  For motors equipped with parallel-connected brakes, their braking power must be supplied from the primary circuit (commercial power supply). If the brake power is connected to the inverter power output circuit (secondary circuit) by mistake, problems may occur.
  Do not use inverters for driving motors equipped with series-connected brakes.
- **Geared motors**
  If the power transmission mechanism uses an oil-lubricated gearbox or speed changer/reducer, then continuous motor operation at low speed may cause poor lubrication. Avoid such operation.
- **Single-phase motors**
  Single-phase motors are not suitable for inverter-driven variable speed operation. Use three-phase motors.

Environmental conditions

- **Installation location**
  Use the inverter in a location with an ambient temperature range of -10 to 50°C.
  The inverter and braking resistor surfaces become hot under certain operating conditions. Install the inverter on nonflammable material such as metal.
  Ensure that the installation location meets the environmental conditions specified in "Environment" in inverter specifications.

Combination with peripheral devices

- **Installing a molded case circuit breaker (MCCB)**
  Install a recommended molded case circuit breaker (MCCB) or an earth leakage circuit breaker (ELCB) in the primary circuit of each inverter to protect the wiring. Ensure that the circuit breaker capacity is equivalent to or lower than the recommended capacity.
- **Installing a magnetic contactor (MC) in the output (secondary) circuit**
  If a magnetic contactor (MC) is mounted in the inverter's secondary circuit for switching the motor to commercial power or for any other purpose, ensure that both the inverter and the motor are fully stopped before you turn the MC on or off. Remove the surge killer integrated with the MC.
- **Installing a magnetic contactor (MC) in the input (primary) circuit**
  Do not turn the magnetic contactor (MC) in the primary circuit on or off more than once an hour as an inverter fault may result. If frequent starts or stops are required during motor operation, use FWD/REV signals.
- **Protecting the motor**
  The electronic thermal facility of the inverter can protect the general-purpose motor. The operation level and the motor type (general-purpose motor, inverter motor) should be set. For high-speed motors or water-cooled motors, set a small value for the thermal time constant to protect the motor.
  If you connect the motor thermal relay to the motor with a long cable, a high-frequency current may flow into the wiring stray capacitance. This may cause the relay to trip at a current lower than the set value for the thermal relay. If this happens, lower the carrier frequency or use the output circuit filter (OFL).
- **Discontinuance of power-factor correcting capacitor**
  Do not mount power factor correcting capacitors in the inverter (primary) circuit. (Use the DC REACTOR to improve the inverter power factor.) Do not use power factor correcting capacitors in the inverter output circuit (secondary). An overcurrent trip will occur, disabling motor operation.
- **Discontinuance of surge killer**
  Do not mount surge killers in the inverter output (secondary) circuit.
- **Reducing noise**
  Use of a filter and shielded wires are typical measures against noise to ensure that EMC Directives are met.
- **Measures against surge currents**
  If an overvoltage trip occurs while the inverter is stopped or operated under a light load, it is assumed that the surge current is generated by open/close of the phase-advancing capacitor in the power system.
  We recommend connecting a DC REACTOR to the inverter.
- **Megger test**
  When checking the insulation resistance of the inverter, use a 500V megger and follow the instructions contained in the Instruction Manual.

Wiring

- **Wiring distance of control circuit**
  When performing remote operation, use twisted shielded wire and limit the distance between the inverter and the control box to 20m.
- **Wiring length between inverter and motor**
  If long wiring is used between the inverter and the motor, the inverter will overheat or trip as a result of overcurrent (high-frequency current flowing into the stray capacitance) in the wires connected to the phases. Ensure that the wiring is shorter than 50m. If this length must be exceeded, lower the carrier frequency or mount an output circuit filter (OFL).
  When wiring is longer than 50m, and sensorless vector control or vector control with speed sensor is selected, execute off-line tuning.
- **Wiring size**
  Select cables with a sufficient capacity by referring to the current value or recommended wire size.
- **Wiring type**
  Do not use multicore cables that are normally used for connecting several inverters and motors.
- **Grounding**
  Securely ground the inverter using the grounding terminal.

Selecting inverter capacity

- **Driving general-purpose motor**
  Select an inverter according to the applicable motor ratings listed in the standard specifications table for the inverter. When high starting torque is required or quick acceleration or deceleration is required, select an inverter with a capacity one size greater than the standard.
- **Driving special motors**
  Select an inverter that meets the following condition: Inverter rated current > Motor rated current.

Transportation and storage

When transporting or storing inverters, follow the procedures and select locations that meet the environmental conditions that agree with the inverter specifications.

Fuji Electric Co., Ltd.

Gate City Ohsaki, East Tower, 11-2,
Osaki 1-chome, Shinagawa-ku,
Tokyo 141-0032, Japan
Phone: +81-3-5435-7057 Fax: +81-3-5435-7420
URL: http://www.fujielectric.com/

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